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SECTION OF GEOLOGY AND MINERALOGY

MAY 1, 1944

DOCTOR CHARLES S. DENNY, Wesleyan University, Middletown, Conn.: *Glacial Geology along Alaska Highway from Dawson Creek, British Columbia, to Whitehorse, Yukon Territory.*[1] (This lecture was illustrated by lantern slides.)

The Highway follows the western edge of the Alberta Plateau from Dawson Creek northward to Fort Nelson, British Columbia, a distance of about 300 miles. A subsequent lowland separates remnants of this plateau from the foothills of the Rocky Mountains to the west. The contact between Rocky Mountain drift and Keewatin drift lies in this lowland. The Rocky Mountain drift lies beneath the Keewatin drift and the two are separated by lake deposits. The Keewatin drift is slightly weathered to a maximum depth of eight feet.

At Summit Lake in the northern end of the Rocky Mountains about 80 miles west of Fort Nelson, there is a bouldery, lime-cemented till probably of pre-Wisconsin date. At the earliest stage of the last epoch of mountain glaciation in the Summit region, glaciers extended far down the valleys to elevations below 3500 feet. The three (?) retreatal stages of these valley glaciers are probably of late Wisconsin date.

[1] These observations were made during the summer of 1943 when the author was a member of an expedition led by Dr. H. M. Raup of the Arnold Arboretum, Harvard University, under the auspices of the Joint Economic Committees, Canada-United States. The geological work was financed by a grant from the Penrose Fund of the Geological Society of America.

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The Liard River above the Grand Canyon follows a narrow flood plain incised below a kettled outwash terrace. The headwater region of the Liard near Watson Lake is a broad lowland of bouldery till-covered hills and outwash plains dissected by the Liard and its tributaries. The large lakes and rivers in the Teslin to Whitehorse district are surrounded in part by outwash plains and lacustrine silt and clay. These deposits were laid down around wasting valley glaciers.

Various types of mass movements, notably slumps or debris slides, are characteristic of many slopes especially in the region east of the Rocky Mountains.

Stone-rings and stripes and related structures resulting from frost action were described from the Summit Lake area, from the Alberta Plateau near the Beatton River and from peaks between Squanga and Little Atlin Lakes. The relationship of the vegetation to these various soil structures suggests that the former has gained a foothold on surfaces which were more actively frost-heaved in the recent past.

The various types of vegetation and the glacial deposits were mapped on aerial photographs, and some probable relationships between the soil and the vegetation were noted.

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SECTION OF BIOLOGY

MAY 8, 1944

DOCTOR DEAN BURK, MARIE L. HESSELBACH, DORIS F. MACNEARY, and DOCTOR RICHARD J. WINZLER, National Cancer Institute, National Institute of Health, United States Public Health Service, Bethesda, Md.: ***The Vitamer Concept.****

As science and the sciences develop, it is rewarding to recognize and acknowledge early the new concepts, principles, and criteria that constantly emerge from new observations and data, and to crystallize such generalizations with appropriate nomenclature that will be found convenient and useful by those who are confronted with the need to deal with and express the ideas back of the terms. Experience shows that realization of the various general possibilities and interrelationships covered by and anticipated by such new terms greatly accelerates the development of suggestions for new experiments and applications that would otherwise be arrived at far more slowly and laboriously and less systematically. Although much terminology will be proposed in what follows, the primary interest will naturally rest in the underlying concepts outlined.

Vitamers. The rapidly developing recognition of the multiplicity of chemical compounds that possess a specified vitamin activity has created a scientific need for a term that will indicate a biological relationship between all such compounds, naturally occurring or synthetic. The term *vitamer* has been proposed[3, 4, 5, 6, 7, 13, 24a] to refer to any one of a number or group of chemically related nutrient compounds that act to overcome a given vitamin deficiency in one or another organism, plant or animal. The degree of chemical relationship need not be very close: that existing between biotin and pimelic acid could suffice, as would also isosteric relations; but quantitative synergistic relations between members of different vitamer groups, such as occur between vitamin A and vitamin E, are not ordinarily implied. Each group of vitameric compounds may, for convenience, be named with reference to the initially established vitamin whose activity defines the group. Thus, there are now many known biotin vitamers, niacin vitamers, thiamin

* This paper covers the conceptual aspects of an illustrated lecture delivered by Doctor Dean Burk before the Section of Biology, under the title of "Biotin Vitamers in Metabolism." The lecture included a large amount of experimental data, too extensive to be given here, on biotin vitamers in assay, growth, metabolism, and synthesis by lower and higher organisms.

vitamers, pyridoxin vitamers, A vitamers, D vitamers, E vitamers, K vitamers, etc.

It follows from the foregoing that all vitamers are either vitamins* or vitamin precursors, but a particular vitamin becomes classifiable as an actual rather than potential vitamer only after at least one other compound with the same type of activity has been discovered. The term vitamer possesses essentially all of the connotations and attributes of the term vitamin, but, in addition, it serves to classify vitamins into group relationships based upon specified *activities*. The term vitamer is intended to refer primarily to biological activity or function, rather than to a chemical formula or formulae; for molecular structure alone cannot—by the principle of holism—account fully for biological function, any more than can other chemical or physical properties of molecules or substances, e.g., oxidation-reduction potential, polarographic (mercury electrode) potential, dielectric constant, acid-base dissociation constant, radiation absorption constants, optical rotation, density, melting point, boiling point, specific heat, etc.

After being taken into a living system, it may or may not be necessary for a given vitamer to undergo further chemical change before becoming active. Whether active or inactive when administered, all related substances which ultimately satisfy a given vitamin requirement are vitamers (vitameric). The active form or forms in the organism may well differ from the form supplied in the diet, as in the case of administered thiamin that is converted in an organism into the active coenzyme thiaminpyrophosphate (cocarboxylase). In the majority of cases studied so far, however, it would appear that various vitamers satisfying a given requirement are usually converted into the parent or prototype vitamin by which the vitamer group was first recognized. Thus, miotin, tiotin, and the diaminocarboxylic derivative of biotin (DAC), all avidin-uncombinable vitamers of biotin, have been shown[4] to be converted during utilization of *Saccharomyces cerevisiae* Fleischmann strain 139 into an avidin-combinable vitamer as yet undistinguishable from biotin; likewise, desthiobiotin, an avidin-combinable vitamer of

* A vitamin is an organic compound required in small amounts in the nutrition of a given organism otherwise supplied adequate amounts of protein, carbohydrate, lipid, and minerals. It is recognized as a vitamin by its biological activity in overcoming a particular deficiency or syndrome. A cardinal feature of a vitamin is that it must be a nutritional component, i.e., it must be supplied to the organism. Its mere occurrence in an organism is not a sufficient or even necessary criterion of its being a vitamin for the organism, since the organism may have synthesized it as a by-product and may not be making any use of it. Although the chemistry and internal physiology of vitamins, hormones, enzymes, and other similar types of biologically active materials are now known to have many aspects in common, the distinctive nutritional aspect of a vitamin makes the retention of this term as necessary, and more useful, than ever.

biotin, has been shown[8] to be converted by this strain of yeast to a vitamer that is presumably biotin. The conversion of beta-carotene and other provitamin A compounds to vitamin A, which is stored in the liver, is also a familiar example.

It must be emphasized that in using the term vitamer, as in using the term vitamin, it is always necessary to keep the species requirement in mind, implicitly if not explicitly. For, just as in the case of any vitamin, a vitamer may be required (utilized) in the nutrition of one species but not in the nutrition of another, in which case it is not a vitamer or a vitamin for the latter species, even though it is for the former. Thus, desthiobiotin is utilized by, and hence a biotin vitamer for, *Saccharomyces cerevisiae* str. 139,[8, 20] 25 other strains of this species,[19] and many other organisms;[19] but desthiobiotin is not utilized by, and hence not a vitamer or vitamin for, *Lactobacillus casei*,[8, 19, 20] *Rhizobium trifolii*,[19] and various other organisms.[19] It must also be kept in mind that the existence of a species requirement, or the demonstration thereof, may depend upon particular conditions, even highly artificially imposed ones; thus administration of antivitamins may induce a vitamin deficiency, even where none appeared to exist before, as in the cases of avidin-induced biotin deficiency, isoriboflavin-induced riboflavin deficiency, pyrithiamin-induced thiamin deficiency, or sulfonamide-induced *p*-aminobenzoic acid deficiency. It is also well recognized that the vitamin requirements of an organism may be greatly modified quantitatively or synergistically[24b] (vitamin balance) by the nature of the rest of the diet, or even qualitatively by other environmental or hereditary (adaptational or mutational) factors.

The question of species response assumes especial importance in bioassay. A material being analyzed may contain vitamers not utilized by the assay organism; thus, human urine contains (in addition to biotin) the avidin-uncombinable miotin, which is not utilized by, or assayable with, or a vitamer (or vitamin) for, *Rh. trifolii*, although it is for *S. cerevisiae* str. 139.[4] On the other hand, the assay organism may respond to vitamers for it is present in, but not necessarily utilized by or a vitamer for, the organism being analyzed; thus, *S. cerevisiae* str. 139 responds to avidin-uncombinable biotin materials contained in animal tissues and tumors, in which tissues a definite vitameric function of such materials yet remains to be demonstrated or contraindicated. A careful experimental distinction between vitamers and en-

tirely unrelated accessory growth substances that may also increase growth or function is necessary here.

That a compound is not active as a vitamer for some species (or under some conditions) does not preclude its classification as a member of a vitamer group with which it has already been identified by virtue of a given vitamin activity among certain other species. Obviously, it is not necessary for all members of a given vitamer group to be active in all species, any more than that a particular vitamin must be required by all species in order to be referred to, upon appropriate occasion, as a vitamin. Thus, even though ascorbic acid is not normally required in the diet of the rat, and is therefore not normally a vitamin (or vitamer) for the rat, the tissues of the rat contain ascorbic acid (as a result of synthesis), and this may be analyzed for and identified as a C vitamer by some other species which does require a C vitamer in its nutrition.

In this last connection, ascorbic acid may be referred to as an *auto*-vitamer for the rat, if it is synthesized by the rat's tissue, for it presumably performs the same function in the rat as vitamin C does in species that require it in their nutrition. Vitamins synthesized in the intestinal tract by microbial flora thereof are probably now best regarded as true vitamins (or vitamers) and not autovitamins (or autovitamers) for the host, since so far as the living host organism is concerned, the intestinal flora represent an independent source, and the same would be true of vitamin compounds similarly synthesized by any other parasite or symbiont located even more definitely within the host, as in the case of invading pathogens. Since the use of essentially sterile animals, free of micro-organisms, will probably shortly be a laboratory commonplace, it is probably best to anticipate this approaching experimental situation, when the view just expressed will also, as a consequence, be commonplace.

As a concluding reflection it may be pointed out that a compound may conceivably, by virtue of a multiplicity of chemical properties, be divitameric or multivitameric, i.e., belong to more than one vitamer group, just as methionine may serve to provide both methyl groups and sulfur in nutrition; or a synthetic compound might be prepared between niacin and biotin with activity as both biotin and niacin vitamers; the extreme case would be the compound that provided all vitamin activities, the universal vitamin!

Other -mer terms. At considerable risk of loss of simplicity, the

usefulness, convenience, and derivation of the term vitamer can be further elucidated by pointing out that since the introduction of this word into the English language a number of corresponding terms, possibly of lesser immediate service, have arisen in consequence. Thus, a hormomer is any one of a number of chemically related compounds that possess a given hormonal activity[6, 7, 16] and, in the field of plant hormones, there are auximers,[2, 6] or epinastamers, hyponastamers, parthenocarpamers, etc. Any number of entities, biological or otherwise, that possess a particular activity, function, or purpose may be expressed by words of similar construction and implication ending in -mer*; and all such words may be conveniently used as certain other parts of speech, particularly the adjective form.

The word isotel has been proposed[25] to indicate a relationship between entities that have the same purpose (Gr. *telos*), but unfortunately this word does not specify *which* purpose. A -mer word, on the other hand, does state or imply—in its first part—the specific purpose or activity involved. Isotel is useful and good as a general term, but it is clearly inadequately definitive of, and no substitute for, a -mer term, when it is desired to indicate a particular activity or function (vitameric, hormomeric, auximeric). To utilize the term isotel to specify *which* purpose or activity, one would be constrained to employ such phraseology as vitamin isotel, hormone isotel, auxin isotel, which would become especially awkward were other parts of speech than the noun employed.†

* The new -mer words have been made up of components that take their prime meanings from connotations of modern scientific words in *present-day English*, without regard to partial coincidental derivation that might be possible from roots existing in ancient languages or from any misplaced belief in the necessity for using unmixed roots thereof, a belief belied by numerous accepted scientific English words so derived. Full derivation from ancient languages is precluded in the present -mer instances by the principle of holism, according to which the whole is greater than the sum of its parts. Thus, etymologically, the word vitamer is not, in fact, coined as a combination of ancient Latin and Greek components meaning literally "life-part,"[17, 25] but actually took origin and development from the great bulk of implications of the modern scientific word vitamin, and from the usual implications invested in those modern scientific words in the English language by the ending -mer. The first parts of the -mer words, such as vitamers, hormomers, auximers, etc., usually involve contractions of words implicating purpose or activity, the degree of shortening of the etymon, or primary word giving rise to the -mer derivative, being governed as much by euphony as by any other consideration; by analogy, avidin represents a convenient and euphonious contraction of avidalbumin. Where it might be desired to take the name of any chemical vitamer compound of well-known activity as a point of reference, whether or not it is the first one of a given vitamer (or hormomer, etc.) group discovered, one might say niacinamer, biotinamer, miotinamer, desthiobiotinamer, etc., where this system does not become awkward with long chemical names. In any event, the suffix -mer (implying form of, part of, type of) indicates a group relationship based on a specified activity, function or purpose given by or implied by the first part of the word.

† To avoid this difficulty one might say vitatel, hormotel, auxitel, or biotinotel, miotinotel, niacinotel, etc., but this would be redundant since the first parts of these words already imply a given purpose or activity; and, moreover, such words are not as euphonious, especially in other parts of speech, as the corresponding words ending in -mer, where there is no such redundancy. Corresponding difficulties occur with isovitamin, isohormone, isobiotin, isoniacin, etc., though to a lesser degree, and the prefix iso- already has connotations in chemical literature referring, in such words as isotherm, isobar, etc., to aspects of entities that are actually identical.

Anti -mers. Just as the existence of various antivitamins is now well established, so there are antivitamers, antihormomers, antiauximers, etc., with equivalent significances. Specifically, an antivitamer is either (1) any antivitamin, nutritive or otherwise, that interferes with the activity of one or more members of a given vitamer group, or (2) any one of a group of antivitamins that interfere with the activity of a single vitamin for which there may yet be no known vitamers. An antivitamer might thus act against all known members of a given vitamer group, with all tested species, under all tested conditions; but, as a minimum for classification as an antivitamer, it need act only against one vitamer, in one species, under one particular set of conditions; or, if it is one of a group of antivitamins, then against only one vitamin, in one species, under one particular set of conditions. Whereas vitamers are vitamin forms that can replace one another, antivitamers include either antivitamins that can replace one another or a single antivitamin that interferes with any member of a vitamer group. An interesting example, among many that might be cited, is that of antivitamers inhibiting one vitamer but not another of the same group, as in the inhibition by beta-aminobutyric acid and isoserine of yeast growth in the pantothenic acid vitamer beta-alanine, but not (in the concentrations tested) in growth with pantothenic acid itself.[21, 22]

It is also to be pointed out that a given compound may be (1) vitameric with one species or under one particular set of circumstances, (2) antivitameric* with another species or under another particular set of circumstances, or even, (3) nonvitameric, or (4) nonantivitameric, as is clearly established by many experimental instances already observed: e.g.,[19] (1) desthiobiotin acted as a biotin vitamer for 25 strains of *S. cerevisiae* and also some 15 other organisms; (2) as an antibiotin (biotin antivitamer) for *L. casei, Sordaria fimicola,* and *Ceratostomella pini* 416; and (3) was inactive (at the concentrations tested) for growth of *Ceratostomella pini* 416, *Sordaria fimicola, L. casei, L. arabinosus,* and *Rh. trifolii* 205, in a biotin vitamer-free medium; and (4) did not act as an antibiotin for *L. arabinosus* and *Rh. trifolii* in medium containing biotin. In referring to or naming various antivitamers, one

* When a given compound is both vitameric and antivitameric (under differing circumstances), it may be referred to as *amphi*vitameric, just as when a given compound is both carcinogenic and anticarcinogenic (under differing circumstances) it is termed amphicarcinogenic.[6] The existence of a number of demonstrable amphivitamers makes it desirable to weld the concept of amphivitamer into our experimental thinking and interpretation of the bewildering array of nutritional data at hand.

may speak of, e.g., biotin antivitamer, niacin antivitamer, etc., where it is not necessarily desired to specify which particular vitamer of a given vitamer group is acted against; but where it is desired to specify the actual vitamer of a given vitamer group acted against, one could say antibiotin, antibiotin methyl ester, antimiotin, etc.

Three now generally accepted types or modes of antivitamin action apply likewise to antivitamer action: (1) competition, (2) combination, and (3) destruction. Thus, for example, in the case of biotin or certain vitamers of biotin, one has (1) (reversible) competition by desthiobiotin in certain species, (2) combination with avidin, and (3) (irreversible) destruction by H_2O_2 or other oxidizing agents.

It is important to note that a chief point of interest about antivitamers (and similarly with other types of antimers) is that they may create a vitamin need, even where none existed before, and that they may do this without calling for the extensive modification of the rest of the diet that is commonly required when a vitamin deficiency is established by its attempted omission from the diet, or by attempted prevention of intestinal synthesis. The relative specificity of antivitamer action provides a relatively specific elimination or blocking of the normal vitamin (vitamer) activity. This assumes importance, not only in academic studies, but also in therapeutic and industrial applications, where the course of disease, or the course of, say, fermentation, might be greatly altered in a desired and regulated manner. The possibilities in cancer studies for producing effective vitamin deficiency differentials between normal adult tissues and growing neoplastic ones, especially by means of the antivitamers that act competitively, have been discussed elsewhere[6]: "Rapidly growing tissue such as tumor presumably must synthesize its vitamin-containing enzymes from available constituents, and might thus have its new growth made up in part with inactive or competitive forms of vitamers that might be administered. This might result in the inability of the tumor to grow. The more stable normal tissues might have much less tendency to replace their active vitamers with the inactive forms and thus could be affected to a much lower extent than the proliferating tissue."

As concluding remarks, it may be stated that the concepts and nomenclature outlined in this paper have been advanced on the basis of ideas arising from informal discussion and consultation with many others, particularly at symposia and meetings such as the Gibson Island Conferences on Chemical Growth Factors and Vitamins held during the

past two years, where, in fact, all of the actual -mer type terms cited first took origin or underwent announcement.* Whereas the vitamer terms may be regarded as adequately crystallized, the other types of -mer terms may be looked upon as logical extensions that must undergo further testing in regard to need and use by workers in the respective fields. It is obvious that all such terms deserve a place in language when and in so far as they are useful and serve a need. It is only on such a basis that they have been set forth here. Moreover, it is not wise to seek or anticipate realization of absolutely sharp definition, for, in the words of G. N. Lewis,[18] "The theory that there is an ultimate truth, although very generally held by mankind, does not seem useful to science except in the sense of a horizon toward which we may proceed, rather than a point which may be reached."

* According to Hickman,[14] the word vitamer and its adjective "vitameric" were coined and used by him and his research associates for some time before their first verbal proposal by him in a discussion at the 1942 Gibson Island Vitamin Conference,[13] which proposal was made following conversation with one of the present writers as to which word—isovitamin, vitaminamer, vitamer, etc.—would best satify our respective and independently developed needs for a term to indicate group relationships within the A vitamins or E vitamins on the one hand and various compounds with biotin activity on the other. The dual origin of a need for some such term in separate research groups shows how necessary an expanded nomenclature had become for the proper advancement of vitamin research, and the same may be said, in regard to other fields, for the subsequent and consequent derivations by ourselves and others of hormomer[16] auximer,[3] etc. A good description of the early origin and development of the term hormone, coined by W. B. Hardy, is given by Sir Wm. Bayliss,[1] and of the original term vitamin itself by Casimir Funk,[10, 11, 12] and of some of the early inertia regarding the term vitamin by an editorial.[9] In this connection, it is of interest that, according to Jacoby,[15] "In 1911, when Dr. Funk was working at the Lister Institute in London, he submitted several papers for publication to the head of the department who crossed out the word 'Vitamin' whenever it appeared. In 1912, Dr. L. Reichmann asked Dr. Funk to write a summary of his papers and ideas for the Journal of State Medicine, London.[10] This paper as a review did not have to be submitted to the Lister Institute before publication and therefore the word 'Vitamin' (then spelled 'Vitamine') passed."

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SECTION OF PSYCHOLOGY

MAY 15, 1944

DOCTOR WALTER FREEMAN, and DOCTOR JAMES W. WATTS, Department of Neurology, George Washington University, Washington, D. C.: *Behavior and the Frontal Lobes.* (This lecture was illustrated by lantern slides.)

The frontal lobes have excited the curiosity of scientists for more than a century, but they have excited the admiration of the sculptor, the painter and the poet variously for more than the duration of recorded history. For it was when man first began to look about him and to recognize the differences between himself and his fellows, and then to look more closely at the individuals he admired most, that he singled out the person with the broad and shining forehead as the epitome of everything noble. And whence did Athene spring, full panoplied, but from the brow of Jove?

The frontal lobes have received panegyrics and encomiums on the one hand, and disparagement and neglect on the other. From the first high-flown theories of Gall and Spurzheim with their super-localization down through the annihilating verbosities of Flourens and then up again with Bianchi and down with Pavlov, the frontal lobes have undergone a variety of treatment (one might almost say punishment) that has continued to the present. Perhaps Tilney has expressed most clearly the ennobling influences of the frontal lobes, while, even in our day, Lashley insists that brain function depends upon brain mass, and Kleinst and Goldstein are poles apart in dividing up the functions of the frontal lobes in accordance with cytoarchitectural differences. To return to Tilney: "Perhaps it is hazardous to define any single area in the brain as the region of supreme organization. . . . Yet it is reasonable to attribute a certain superiority to that neopallial region which is charged with the functional representation of all other cortical territories, which combines the highly particularized functions of all other areas in broader impressions of human existence, which acts as the accumulator of experience, the director of behavior, and the instigator of progress." And our friend Karpman says he will some day write a paper: "The Frontal Lobes; Enemies of Mankind." Which way lies the truth? Both ways.

We believe that we can best enter upon a discussion of the prob-

lem of behavior and the frontal lobes by presenting certain characteristic reactions of individuals who have resumed their place in society following prefrontal lobotomy for the treatment of disabling mental disorders. We can then see where these individuals fall short of the ideals of human behavior and also where they excel. By analysis of the various factors we may be able to determine what it is that is added to human personality by possession of intact *and harmoniously functioning* frontal lobes. Finally, by analysis of the same set of facts, we may be able to determine what handicaps, pitfalls and disasters may result from perverted activity of those same frontal lobes. Substantially, the frontal lobes would seem to occupy a place of supreme importance for human betterment; yet for the individual their possession may be an intolerable burden leading to suicide and psychosis. But first we may describe the operation of prefrontal lobotomy and what happens to the brain as the result of operation.

Prefrontal Lobotomy

The frontal regions of the scalp are shaved and sterilized, and the surgeon then marks the midline and the approximate location of the coronal suture. After incising the scalp vertically, centering about a point on this line 6 cm. above the zygoma, he retracts the tissues and places a burr hole through the coronal suture on both sides. He reflects the dura, secures hemostasis, punctures the cortex in an avascular area, and then, under guidance, measures the diameter of the frontal lobes by passing a long cannula from one opening in the skull through the genu of the corpus callosum and out through the hole on the opposite side. He then locates the sphenoidal ridge by angulating the cannula downward toward the base of the skull. When he has located this ridge by slipping over it into the middle fossa, his assistant notes the relationship of the cannula with the line drawn upon the scalp, and if necessary, this line is redrawn. The surgeon removes the cannula and inserts a blunt knife along the original tract of the cannula, and at a depth of 4 cm. or thereabouts, depending upon the width of the frontal lobes, makes a sweeping incision first upwards, then downwards, always maintaining the knife in the selected plane. After washing out the wound with saline to control what little bleeding may occur, the surgeon deepens the incisions by making radial stab incisions that bring the broad tip of the knife substantially to the midline, severing the remaining fibers in the upper and lower quadrants of the frontal

lobes. He then makes his final irrigations and injects a few drops of iodized oil into the depths of the incisions and proceeds with the same technic on the opposite frontal lobe. He closes the incisions, bandages the head and marks upon the bandage the exact location of the burr holes so that the technician can accurately center the patient's head when making the roentgenograms. Satisfactory films are of great importance in determining the cause of failure of an operation. If the incisions are accurately placed but the patient's mental condition is unimproved, we conclude that even more of the frontal lobe tissue must be sacrificed at a second operation. If the incisions vary to any considerable degree from the plane selected, we may reoperate. If the incisions lie too far anterior; or, if the incisions run behind the ideal plane too far, we may prepare the relatives for a prolonged, difficult and incomplete convalescence.

The immediate postoperative course following prefrontal lobotomy is of some importance to the understanding of the functions of the frontal lobe. The picture is clouded, however, by the presence of a large number of phenomena that are probably more readily explained by diaschisis, the temporary throwing out of function of undamaged nerve cells when their incoming stimuli are abolished by severing their afferent connections. However, diaschisis is not the entire explanation. We prefer to operate upon patients under local anesthesia so that their conversation can be recorded. Even when three of the four quadrants are severed, the patients may still be able to carry on a coherent conversation in full contact with their environment. It is only when the fourth quadrant is sectioned, and sometimes only following the radial stab incisions, that their replies become irrelevant, difficult to obtain, and manifest complete disorientation. In explaining this phenomenon, we have supposed that the functions of alertness and orientation are exercised by the posterior portion of the frontal lobe, and that severing connections far back has the effect of throwing out of function enough of the cellular constellations lying anterior to the incisions to leave those lying posterior incompetent to maintain these rather basic functions of the personality. The farther forward the sections are made the less manifest are these alterations, whereas the farther back the incisions are made the longer the time elapses before liveliness and orientation are regained.

In addition to inertia and disorientation there are a number of other symptoms that are transitory, some of them disappearing rap-

idly, others slowly. Vomiting usually disappears in a day or two, even though it may have begun at the first incision on the second side. Vesical incontinence is very common in the early post-operative stage but usually disappears even after a very extensive operation. Masking of the face and plateau speech are usually observed following operation in the plane of the coronal suture, but not when the incisions lie anterior to this landmark. Such phenomena are prolonged when the fibers are severed back of this plane, and when the incisions lie far enough back it is not uncommon to observe reflex grasping and a positive Babinski sign. The farther back the incisions lie, the slower the return of normal function. Some patients do not utter a word for days or weeks after an extensive operation, not because of aphasia but apparently because of inertia. Eventually, they regain their language function, often rather suddenly and then completely, without the stages of recovery that one observes in aphasia.

Inertia may also take the form of perseveration, which is merely a repetition of the same act over and over again. We have saved some letters written by patients a few days after operation and have seen the same word or phrase repeated over and over again, line by line and page by page. Recently we watched a patient working out with a punching bag, striking it rhythmically 72 times a minute with the same hand, never missing and never changing his stroke, over a period of seven minutes before we finally distracted him sufficiently to get him astride a stationary bicycle. He then kept up rhythmic pedaling for another half hour, seldom varying the speed and with the same set expression upon his face. It was necessary to pull his feet from the pedals in order to make him stop for supper.

In contrast to the inertia that develops immediately following operation in the posterior parts of the frontal lobes, is the excessive liveliness and high spirits that occur if the operation is placed anteriorly. Sometimes, on the evening of operation, there is noted considerable restlessness and overactivity, singing and whistling, a sort of careless gaiety that contrasts strongly with the somber mood or anxious state that had prevailed preceding operation. This is now looked upon as an unfavorable sign, since the patient always relapses.

Reviewing these two opposite reactions, inertia on the one hand and excessive liveliness on the other, we might argue that the mechanisms underlying self-restraint are to be found in the frontal lobes, as well as the mechanisms underlying alertness and orientation. How-

ever, it would appear that whereas alertness and distractibility increase after an operation anteriorly and then disappear with a return of morbid symptoms, the restraining factors in the personality are mediated by cellular constellations lying in advance of those mediating orientation, particularly since orientation is unaffected by an operation in the anterior plane. Furthermore, with recovery from the inertia, there is apt to be a prolonged period of unproductive overactivity. As one man said of his wife: "She's just like a hummingbird, always on the go. If she'd settle down for a moment sometimes, she'd accomplish something, but she just can't seem to."

Frequently we have had occasion to observe the behavior of a patient following two or even more operations, each one severing connections progressively farther back. Obviously, secondary operations are much more damaging to the patient's capacity for social readjustment, but are necessary in order to interrupt the repetitive behavior characteristic of the psychosis. We recall vividly the case of a young obsessive neurotic who had gone through three operations on his frontal lobes with maintenance of his orientation, alertness and preoccupation. The third operation was limited to one side because of disarrangement of the drapes and hence could not be termed adequate. Following the fourth, there developed immediately a satisfactory degree of inertia, disorientation, masking of the face and plateau speech that made it certain that he would no longer be harassed. He slowly proceeded to make a fairly satisfactory recovery, but he persists in his unproductive overactivity.

We have not been able to determine whether there are any finer localizations in the frontal lobes. Even in our cases of most extensive transection, inertia has gradually given away to varied activity, and disorientation, masking and plateau speech have disappeared. Presumably, the functions of alertness and contact with the environment are carried out by widely distributed constellations of neurones located in the frontal lobes. The only definite indication that they are situated on the mesial surface comes from a case in which inertia, lasting four months until death, occurred in connection with laceration of the anterior cerebral artery, causing extensive cortical degeneration on the mesial aspect of the hemisphere.

Brain Changes

Before discussing other aspects of the personality following pre-

frontal lobotomy, we shall demonstrate what happens to the brain that has been operated upon. We have several examples in which the evidence is corroborated from different points of view, pneumoencephalography, electroencephalography, and necropsy.

The pneumoencephalogram shows moderate to marked dilatation of the anterior horns of the ventricles, sometimes with a porencephalic cyst if the incisions happen to penetrate into the ventricles. There is also a moderate increase of air over the frontal lobes of the brain.

The electroencephalogram varies considerably in different cases and at different periods following operation, but in cases in which the recovery is satisfactory there is apt to be a normal wave pattern. Sometimes, in the early postoperative stages, there are large slow waves, and these would seem to be more marked when the incisions are made far back and in which the caudate nucleus is probably traumatized.

Necropsy studies reveal no gross or microscopic abnormality of the frontal cortex with the exception of the areas directly trespassed upon by the knife. There is no obvious degeneration in the myelin sheaths posterior to the lesions, but there is some degeneration in Marchi preparations anterior to the incisions, chiefly in the superior portions of the frontal lobe. The cysts remaining after operation are clean-cut, with shiny walls, very little fibrosis or gliosis in the vicinity and no significant inflammation, even in the immediate neighborhood of the iodized oil droplets. Finally and most importantly, we believe, there is more or less complete degeneration in the lateral portion of the nucleus medialis dorsalis of the thalamus. In the early months after lobotomy this nucleus is the seat of considerable gliosis, but with the passage of months atrophy occurs with disappearance of both glia and ganglion cells.

Intelligence

Intelligence has long been considered a function of the frontal lobes. However, the tests employed have not been well adapted to the confirmation of this opinion. In fact, in our own studies, as well as in many others reported, the results in this particular situation have been inconclusive. Not infrequently we have observed almost identical scores with a battery of tests made before operation and as early as two weeks afterwards. Sometimes, the scores are even improved, presumably because of the better attention given by the patient to the problem at hand. We have probably been more fortunate than most

investigators in our material, having now a fairly large series of intelligent young individuals coming to operation because of crippling neurotic obsessions, but whose contact with the world of reality has been sufficient to keep them out of institutions. These individuals are able to cooperate to a satisfactory degree in the test situation. Whether the tests comprise the regulation Stanford revision, the Kohs blocks, the cube construction, paper form board, substitution, color naming, or delayed choice tests, the results have been more or less in accord. Similar experiences are reported by Kisker, Hutton, and more recently in detail by Porteus. These findings are also in agreement with the general observations following frontal lobectomy as studied by Brickner, Nichols and Hunt, Wies, Hebb and Penfield, and Ackerly, although Rylander, in unilateral lobectomy cases, reached the conclusion that there was slight reduction in I.Q. Porteus has employed the maze in testing his patients' intelligence and finds a much greater reduction in capacity than is revealed by the Binet Simon test.

The more closely one analyzes the tests employed, however, the more certain it becomes that the tests in which the patients do badly are those in which other factors than native intelligence enter the picture. This was particularly demonstrated, in our opinion, in two cases of bilateral frontal lobectomy studied in a highly artificial situation by Gantt. We believe that the more constricted the test situation is, the more one has to contend with emotional reactions on the part of the patient, and hence the more erratic are the scores. Just as a patient's performance in a given test may reveal to the examiner far more than appears upon paper in regard to the reactions of the patient, so the test as administered brings into play more facets of the patient's personality. About all we can say, on the basis of studies of intelligence, is that it is not permanently harmed by the operation on the frontal lobes. Naturally, there is a period in the immediate postoperative phase when the intelligence cannot be adequately applied to the task in hand, and this period is lengthened in those cases in which extensive operation is performed.

As measured in terms of working ability, the intelligence necessary to operate a switchboard, a typewriter or an automobile recovers within a few days or weeks. Bookkeeping and cooking require greater attention and a sense of timing that are slower to recover. Learning new skills, or even entering upon more complicated situations, such as the practice of law or engineering or management, requires still fur-

ther time, and, unquestionably, there is permanent lowering of effectiveness in many of the individuals operated upon. Whether this is purely a matter of intelligence, however, is debatable, unless the term "intelligence" is broadened to include planning capacity and enterprise, the setting of a goal, and planning of a course to attain it, and the adaptability to the occupation. This seems to be an unwarranted extension of the term "intelligence," since so many other factors, particularly emotional ones, enter into the total behavior pattern.

Allied to intelligence tests are a number of personality profile studies that are at once more vague and also more revealing of the alterations that have occurred in the patient as the result of operation. This is a field that is worthy of further development. At present, the Rorschach test occupies front rank in current interest in the psychological field. In forty cases tested for us by Dr. Thelma Hunt before and two weeks after operation, the conclusions were reached that quantitatively there was relatively little difference. Qualitatively, the test showed that there was less perseveration, less self-reference, less concern and self-criticism, less emotional tension, and that directed outwards, and finally, fewer indications of neurotic trends. Kisker has verified these findings. There is a tendency toward improvement in response with ensuing months in those patients that make satisfactory progress. Surprisingly absent are most of the "signs" of organic brain disease that have been emphasized by Piotrowski.

In a number of our cases, the Kent-Rosanoff and the Bernreuter tests have been applied with results corresponding fairly closely with those of the Rorschach test. It was surprising to observe how great a change took place within two weeks in the patient's opinions concerning himself. We concluded that this resulted from different attitudes and feelings toward his own behavior. There were indicated definite changes toward extraversion, self-confidence and sociability, aspects of the personality that had been estimated at a very low level by our psychotic and neurotic patients previous to operation, but changes which were generally borne out by their behavior in the ensuing months and years.

Social Behavior

Bianchi postulated the frontal lobes as being responsible for "social sense," and, in his monkeys, he described many traits that he considered were indications of a loss of this characteristic. Social sense is

unsatisfactorily vague as far as definition is concerned, but, nevertheless, we have accumulated numerous examples of lack of tact and diplomacy, of arrogance, self-assertion, of childlike enthusiasm and lofty intransigeance, alternating with excessive politeness, humility, modesty and gratitude. On the other hand, gross boisterousness, silly euphoria, indecency, profanity, and knavery are rare. One looks in vain for evidences of altruism, of service to the community, of creative expression in writing, painting, and composing. With prominent exceptions, the people whose frontal lobes have been partially inactivated are very direct, practical, ingenuous and unselfconscious in their dealings with other people. They respond quickly, vividly and directly to the stimulus of the moment, take their cue from their interlocutor. They make enthusiastic companions; and they cannot be insulted. They are ready with their laughter, and quick at repartee, usually of a rather superficial variety, but without rancor. They flare up easily, become petulant on slight provocation, but they do not hold grudges. They take orders gracefully at times, but with outspoken resentment at others. They have only moderate control of their tempers, but the explosions, when they occur, are evanescent, and do not leave them shaken. They appreciate the significance of their acts afterwards, but either do not do so before, or they do not have sufficient self-control to arrest their impulses of the moment. There is a question whether they really feel deeply when they have been in the wrong, and, although they can apologize readily, they are apt to make light of the occurrence and to respond in the same way on the next similar occasion. They can learn by experience, but it is a difficult process for them, time-consuming and often not worth the trouble. If these people would count ten before they strike, it would be much to their credit, but they either cannot foresee the effect that their actions will have upon others, or they just don't care. Amid strange surroundings and with people they do not know well, these patients are apt to be on their good behavior, giving no offense, and conducting themselves with restraint and dignity, whereas, when they are in familiar surroundings and know that they will not be criticized, they indulge in their care-free behavior and give in to their puerile impulses.

It would be unfair to these people to describe them as wholly and completely devoid of social sense. When the convalescent period has passed, the majority of them can return to their place in society. They make earnest, reliable, sober workers, diligent, hard-working, varying

as much in their individual responses to the outside world as do normal persons. Indeed, few of them would be considered abnormal. It is only when they are contrasted with their former selves that the differences appear. We are not intending to present the picture of lobotomized patients as if these people were outstandingly abnormal, since that is not the case. Indeed, it is chiefly because we are interested in the functions of the frontal lobes that we present the peculiarities of these people and emphasize the deviations, even selecting unsatisfactory cases, in order better to present the picture of individuals whose frontal lobes have been partially inactivated.

For example, more than half of the 240 patients treated by this method are sustaining themselves in a social environment, earning a living, keeping house, or doing part time work outside the home. Many more are already in advanced years, and since their families have closed ranks, these people no longer have responsibilities; they have retired, and they live in harmony with their relatives. There are some people of advanced years who would be able to live at home, were there some relatives sufficiently interested to make homes for them. As a matter of fact, only about 10 per cent of the patients who have been subjected to prefrontal lobotomy are confined in institutions. Some of those on the outside are living very restricted lives, more or less household invalids or even household pets, but nevertheless sufficiently integrated to care for themselves in the matter of the intimate details of daily life. At the present time, 90% of our patients are established in the community. It would seem therefore, that the human individual can function quite adequately in a social environment with a relatively limited portion of his frontal lobes. The adaptation possible in a given individual would appear to be conditioned to a considerable extent by the remaining quantity, since operations behind the coronal suture greatly reduce the ability to earn a living or keep house. On the other hand, in a sick individual, the possession of a rather small amount of frontal lobe tissue in front of the coronal suture may be associated with the presence of such functional disorders of behavior that the adaptation is even worse and institutional treatment is necessary. The 10% of patients necessarily confined in institutions represent for the most part inadequate operations or cases in which emotional deterioration previous to operation has been so great as to permit no adequate reintegration of the personality in the domestic environment. Only rarely is a patient necessarily confined because of erratic behavior fol-

lowing operation, as, for example, a lady who cannot say no to an auctioneer or an oil stock salesman.

The types of occupation that patients can exercise following prefrontal lobotomy are quite varied. Few of them are very high. We can point to no artists, writers, doctors, leaders of men or soldiers. One lawyer is working for the Government after burning himself out in private employ and suffering three years of complete disability; another is adjusting badly after giving up his governmental position to enter the army, only to get repeated courts martial for drunkenness and a Section 2 discharge; a third is working in a war industry. A dentist is institutionalized for alcoholism; a veterinarian, however, is carrying on successfully in a modest way. A draughtsman is making a superb adjustment, has patented a machine for grinding elliptical bearings, and is making more money than he ever did before; another is doing adequate work in map-making. Two men are engaged in managing their own small companies. One woman is teaching mathematics in a university. One man is at present teaching the mathematical basis of radio in the Signal Corps, and another is radio operator on a merchant ship. Salesmen, clerks, steel-workers, mechanics, foremen, janitors and so on are other representative occupations. Actually, women far outnumber men in our surgical cases, so that, in the field of sales work and office work, there are many examples, but none of these women has risen to a supervisory capacity or any other considerable position of responsibility. A former bacteriology technician is content as a salesgirl; two interior decorators are no longer functioning in this field; and a number of women have resigned or retired from positions which they held until shortly before operation. On the other hand, a number of women are now employed who never previously held jobs. Indeed, in several instances, these patients seem to be able to handle the social situations called for in office work with better ability than that with which they previously managed their domestic situations. Housekeeping would seem to be an occupation requiring a not inconsiderable degree of foresight and self-restraint, and these qualities are always affected in some degree following prefrontal lobotomy. It is to the credit of many women, therefore, that they are able to return to their exacting tasks; and we point with considerable pride to a lady who, since her operation, has married again and has borne two healthy children.

It may thus be seen that prefrontal lobotomy does not necessarily

mean that a person who is disabled by one type of malfunction of the nervous system will merely exchange this disability for another that may be just as serious but more easy to tolerate. Prefrontal lobotomy brings about certain changes in the orientation of the sick individual that gives him or her an opportunity for cultivating certain capabilities that are of value to society. Even if the higher creative functions are not so much in evidence in the patient who has been operated upon, nevertheless, the functions that remain are consistent with active, pleasurable and productive existence in the highly competitive civilization of today. And yet it is not quite as bad as Ody suggested some years ago: "Society can accommodate itself to the most humble laborer, but it justifiably distrusts the mad thinker." For the most part, the patients have been reasonably capable, undistinguished, uncomplaining citizens, who continue to function in their environment with a minimum of strain. As Hutton states: "They are quite capable of taking thought for the morrow when the occasion requires, but they are content to let the morrow take care of itself."

The Frontal Lobes Add Something

The frontal lobes add something. It is the purpose of this investigation to determine as succinctly as possible what more could be accomplished by these patients if their frontal lobes had not been inactivated, with the proviso that the frontal lobes were functioning harmoniously. Later on, we shall study the harmful effects of perversion of frontal lobe function and its devastating effect upon the personality as a whole.

Substantially, the frontal lobes, in our opinion, add foresight and insight.

The individual with intact frontal lobes is able to construct a mental picture of what will occur in response to a series of activities that he is to initiate in the future. This requires imagination, which is one of the highest forms of cerebral activity. When confronted with a situation, the healthy individual gathers all the information available through his various special senses and calls upon his storehouse of knowledge concerning similar situations in the past, studying the situation as a whole as well as in its various particulars. Here is where the synthesizing activity of the frontal lobes is called upon as was pointed out so ably by Brickner. He assumes an attitude toward the total situation (Goldstein), which is largely conditioned by

his emotional status at the time. Then, as he contemplates the problem, he focuses his attention first upon one aspect and then upon another, projecting himself in each instance into the future and assessing the result of each alternative that presents itself to him. He examines contingencies and probabilities, concentrating upon the relevant and excluding the irrelevant, the unlikely or the impossible. When he has finally satisfied himself that the problem is solved, he then presents to himself the particular steps to be taken in logical sequence in order to bring to fruition the plan that he has adopted. In other words, it is as though the frontal lobes were the focal point through which all the various "beams" of inner light come from the sources in past experience, are gathered together, and are then projected upon the screen of his life in the near or distant future. Schilder expressed this thought quite well: "A normal person has a plan; he lives in the schematic anticipation of what he expects. He is satisfied before he has reached his goal through trial and error, and when he compares the schematic anticipation with the actual result of his thinking processes. A patient with a lesion of the frontal lobe is much more easily satisfied than a normal person. . . . The patient seems to conclude his thinking processes more quickly than a normal person; he does not take time to 'finish up' his thought. In other words, the frontal lobe is necessary for the consummation of thinking."

Foresight is badly impaired for a period after operation. This was notably revealed in a restless and exuberant individual who made a lot of trouble at the hospital. He picked the paint off the armchair and the plaster from the walls; he pulled the screens out of the windows and slapped the nurses on the behind, smirking and making objectionable remarks. Shortly before his discharge, he fixed his attention upon a little red box outside his room and saw in large letters the word: PULL. If he had stopped to examine the box further he would have read the whole direction; "In case of fire PULL." Anyhow, he set off the fire alarm, and, when the nurses, attendants, and others came running, he was apologetic. We endeavored to ascertain what prompted him to pull the handle and finally he said: "Now that I've done it, I see it was not the thing to do, but beforehand I couldn't say whether it would be all right or not." As an example of deficient foresight, this could hardly be improved upon. The later history of this individual is of interest in demonstrating the return of a satisfactory degree of foresight. He had a difficult time of adjustment

for many months following operation, finally culminating in a trip to Reno and a divorce. However, on the trip back East with his paramour, when she suggested to him that they get married and cut off the wife's allowance, he immediately rebelled, discarded the woman and returned to his wife. This was five years ago and the man is managing his own business and living at home more harmoniously than he ever did previously.

The return of foresight is relatively adequate in most individuals. There is a difference between the impersonal and the personal aspects of behavior, however, that is worthy of mention. Occupational adjustment demands greater capacity for foresight in the impersonal than in the personal sense. It is particularly in the matter of personal and interpersonal adjustments that foresight is impaired in patients who have undergone prefrontal lobotomy. A person may be able to formulate and carry out a plan satisfactorily, involving a considerable number of variables, whether it is in card games or business, cooking or law. Not infrequently, the plans made are quite adequate and the execution flawless. The outlook is practical and the approach quite matter-of-fact. While decisions are on the hasty side, they are quite apt to be correct. On the personal side, however, the decisions are apt to be over-hasty. The patient is as if unguarded, or insufficiently protected from saying and doing things that are undiplomatic, hasty, careless or tactless. There is a certain ingenuousness about personal contacts. The frontal lobes, therefore, would seem to be the mechanism whereby an individual is enabled to restrain himself in a personal situation, studying the situation and the people involved, with a delicate sense of feeling for those individuals and an almost unconscious effort to avoid offending. The individual equipped with harmoniously functioning frontal lobes is able to pursue a devious and diplomatic course, avoiding the pitfalls of social intercourse and maintaining his dignity. He is able to postpone the pleasures of eventual success, to dissemble his feelings, to play a waiting game, to simulate affability where distrust exists, to detect motives beneath the other individual's bland exterior and to avoid giving himself away.

In the more purely intellectual fields, the individual with harmoniously functioning frontal lobes is able to foresee what the product he is working on will eventually be like. He can construct things in his imagination, and then get them expressed in the medium he has chosen, whether it is on the typewriter, the piano, the canvas, the lathe,

or the cookstove. Creative work of any considerable complexity is a closed book for most patients with prefrontal lobotomy, although there are a few shining examples of superior performance. Creative work demands foresight, but it also demands concentration, contemplation, a certain subjectivity, an abstract attitude; all difficult for the operated patient. Foresight must be backed up by energy in order to effect consummation, and the energy required for creative effort is of a high order. Presumably, this emotional component that implements the ideas is derived from the native energy of the personality expressed through the emotional mechanisms apparently residing in the thalamus. Time and again, patients have told us of their plans for the future, well-constructed plans that had a good chance of succeeding. However, the patients admitted that they procrastinated. As one lady said: "Every day I wake up and I think of all the things I'm going to do today, and then I put them off until tomorrow, and somehow tomorrow never comes." The frontal lobes supply something of the anticipated results, but when deprived of their thalamic connections they are no longer able to drive the individual forward in the pursuit of perfection. Patients whose frontal lobes have been inactivated are a little too satisfied, a little too content with things as they are, and they lack the drive to pursue a persistent yet flexible course toward a distant goal. They may have plenty of energy, but it is apt to be frittered away in the distractions of the moment, or to be concentrated upon some particular task of no great importance. The patient may be engaged upon a large project, but he becomes lost in the completion of the minor aspects of the situation. With intact frontal lobes, the patient keeps his goal in mind and refuses to allow himself to be distracted by details. His foresight, with the emotional energy to propel it forward, guides him into the channels that will be the most productive of eventual results.

The frontal lobes furnish the individual with a mental picture of himself as he is from moment to moment. They are not necessary so much for the evaluation of past behavior. A patient with inactivated frontal lobes may realize perfectly well that he has said or done the wrong thing, and may be able to give perfectly plausible reasons for such erratic, undignified or tactless behavior. Usually, however, the reasons are apt to be inadequate, and what it amounts to is that the patient has acted upon impulse and without the mature deliberation that comes with proper foresight. However, there is something more

than mere foresight concerned in this type of activity, if we read the reactions of these patients correctly. There is, quite obviously, a forgetfulness of the self in that particular situation. For instance, a patient will pick up some chance remark, some error in grammar, a spot on the hostess's tablecloth, something that sets his imagination to work. He focuses his attention upon the incident, talks about it, magnifies its importance, worries it, comes back to it again and again, and insists upon discussing it, while his wife is trying to distract his attention from it by pointing out how undignified it is to act thus, and while the people around him are more embarrassed by his wife's distress than they are over the incident itself. Meanwhile, the patient goes on in supreme indifference to the social situation that he is creating. He is an "enfant terrible" in the original sense.

This lack of preoccupation with the self can lead to all sorts of amusing slips from dignity. We recall a middle-aged lady of rather formidable proportions who bullied her second husband, a mild-mannered little man, to the point where her friends protested, although he was able to stand a lot of it. "Why shouldn't I have my way?" she asked, "I've always had my way, and I don't expect to stop now." On another occasion, we observed her standing on a street corner under a car stop sign hammering vigorously on the door of a bus that was not stopping for passengers, and gesticulating at the driver with such enthusiasm that the passengers craned their necks and laughed. The spectacle was made the funnier by virtue of the husband who was trying ineffectually and rather pathetically to call his wife's attention to the fact that this was a car stop and not a bus stop.

Sometimes, the lack of self-consciousness permits the operated patient to go about negligently clad, particularly in the home environment. Housecoats and bare feet are occasionally reported, and in some instances both men and women have made rather a joke of the fact that they have to visit the bathroom quite frequently. Criticism produces little in the way of improvement in behavior, since these people are unaffected to a surprising degree by the opinions of members of the family and friends. One does not have to be guarded in criticizing the errors in social behavior of these individuals. They do not have the same capacity to feel hurt or insulted that they had before operation. In fact, the usual mildly couched suggestions that the slip is showing or that the shoestring is trailing is hardly sufficient to cause these patients to pause in their conversation. When it is considered

that women, in particular, are apt to gain weight prodigiously after operation and to spread the seams of their clothes, direct orders to sew up the seam or put on a different dress are usually taken in good part and are then acted upon.

The frontal lobes give the individual an image of himself as he is appearing from moment to moment. He is able to observe his companions at the same time that he is presenting his proposition, whatever it is, watching for signs of approval or disapproval, leading the conversation around the way he wants it to go without giving offense or seeming obtrusive. He is able to formulate to himself the best method of gaining the end he seeks by noting the effect that his words, actions and manners in general are having upon those he is talking with. He is able to dissemble his feelings, and furthermore, is able to inject himself into the situation of the other individual, hearing his side of the argument, lending attention and sympathy, offering a suggestion or two without necessarily becoming autobiographical about it. He can listen patiently, knowing that his turn for speaking will come later, and preparing his words in advance in a manner suitable to the situation.

It is almost impossible to call upon a person who has undergone operation on the frontal lobes for advice on any important matter. His reactions to situations are direct, hasty, and dependent upon his emotional set at the moment, without the reserve and dignity that comes from restraining the self in more mature deliberation. There is something childlike in the directness and ingenuousness of people after lobotomy. The frontal lobes evidently make for delay in the enunciation of opinions, for reserve in the statement of attitudes, and, at the same time, for a deeper appreciation of what goes on within the consciousness of the individual.

It is hardly fair to the patient who has undergone prefrontal lobotomy to say that he is entirely lacking in insight, since he is apt to be well aware of the effect he is having upon the people around him. On the other hand, it is rare to have a patient go at all deeply into his introspections. He is no longer particularly interested. The process of turning the thoughts inward is more difficult and laborious than it is in the case of the normal individual, and apparently is seldom considered to be worth the trouble. One may say, therefore, that the frontal lobes are concerned in furnishing to the individual a certain awareness of himself more or less heavily charged with emotional feeling tone, and that this awareness enables him to meet and converse

with his fellows with a sufficient display of dignity, reserve, interest, patience, altruism, sympathy and helpfulness. Furthermore, the frontal lobes are apparently concerned in the higher social attributes of self-sacrifice, idealism, and exaltation in the contemplation of the infinite. People whose frontal lobes have been inactivated retain the manners of their social upbringing and many of the outward forms of social intercourse, but they are direct, practical and uninspired.

We have pointed out that consciousness of the self applies not only to the social situation, where the individual is a unit of society, but also to the bodily situation, where the individual is a collection of organs. The consciousness of the self in the latter field is reduced equally or even more so than in the former. After prefrontal lobotomy, patients lose their awareness of their hearts and stomachs and colons. Part of the gain in weight that is often observed may be due to the fact that these people do not realize when their stomachs are full. One of our patients developed a vesical calculus after operation, and it was only when his wife noticed bloody urine that he returned to the hospital for cystotomy.

We had occasion recently to observe a young woman whose vasomotor system had always been unstable. In the presence of strangers we demonstrated her as an example of successful occupational adaptation following prefrontal lobotomy. We then called attention to the fact that she was blushing and made some rather pointed remarks upon this phenomenon, asking her if she felt uncomfortable. She denied that she was either embarrassed or uncomfortable. Meanwhile, the blushing spread not only over the face but over the upper part of the body and arms, the conjunctiva became flushed, urticaria broke out, the patient was unable to eat lunch and shortly thereafter vomited, became faint and had to lie down for two hours until the reaction passed away. Throughout this whole reaction she denied that she was suffering either humiliation or discomfort. Only the next day she stated that she didn't want to be demonstrated again that way. It had been too strenuous.

Our observations upon visceral distress in relation to the frontal lobes have been rather impressionistic, but we have been successful in almost every case in relieving such distress as occurs in hypochondriacal individuals, in the psychoneuroses and in one case of severe conversion hysteria. Furthermore, in conditions in which there are severe and painful arthritic, muscular or nervous disorders, we have

observed disappearance of the distress, even though the pain and other disability might continue. In the case of hysteria, for instance, there were decided arthritic changes, not only in the spine but also in the lower limbs, and when the patient was first pulled out of bed after two years of complete invalidism, we could hear the crepitus across the room. The patient walked of her own accord, even after she sprained, in turn, each of her weakened ankles. Now, more than seven years after lobotomy, she still has pain in the back and limbs, but it does not disable her; in fact, unless she is asked about it, she never mentions it. In another case, there were definite indications of injury to the cauda equina with severe vesical tenesmus and complete disability. Prefrontal lobotomy relieved the pain and distress after half a dozen local operations, including two explorations of the cauda equina had failed. Some patients, after undergoing lobotomy have died of other diseases, one in particular of carcinoma of the colon. We were informed that she bore the pain with "amazing fortitude."

From these observations, we are inclined to draw the conclusion that the frontal lobes are of importance to the human economy in interpreting pain. Patients react to painful stimuli in just the same way following lobotomy as they did before, but they no longer anticipate pain to the same degree. We have sometimes made gestures toward a painful area as though to injure it, but without observing any defense reaction unless the part was actually contacted. The person with intact frontal lobes is made aware of sensations arising from his body and of their implications in terms of pain, disability and future consequences. Such sensations arising from the body suffice to guide him, for instance, in the cessation of eating before abdominal distention becomes noticeable. They terminate his physical activity before he becomes exhausted. They cause him to seek medical advice when the explanation of discomfort is inadequate. They cause him to seek the cause and relief of distress, and, under normal conditions, to bear with equanimity and patience the disability. The frontal lobes are not necessary, apparently, for protection against gross threats to safety. People who have undergone prefrontal lobotomy do not cut or burn themselves. They do not drink poisons or overdose themselves with medicines. Sometimes, they are injudicious in the use of alcohol, being apparently unaware of the effects that the liquor is having upon them until they have become intoxicated, and they are more sensitive to the effects of alcohol than before operation. It is in the more

delicate adjustments to life with the body that the frontal lobes apparently carry out their protective functions.

Perverted Action and the Frontal Lobes

We have discussed in the preceding sections the part played by the intact frontal lobes in the normal individual, how these parts of the brain contribute to the fuller, deeper, richer life of man, how they aid him in conforming with the rules of social intercourse, how they make for progress in intellectual and spiritual fields, how they help him cultivate a decent, restrained, sympathetic helpful, cooperative and altruistic attitude in the world of his fellows. We have emphasized the value of the frontal lobes to the individual in maturing the whole personality, in the cultivation of intellectual interests, in the urge for perfection in the various accomplishments of the arts and sciences. We can quite agree with Tilney that they are the instigators of progress, with Bianchi, that they underlie the function of social sense. How, then, can these frontal lobes conduct the individual to the brink of psychosis and suicide? How can they reduce him to the filthy, resistive, combative, assaultive, violent patient, utterly unable to care for himself and to observe the decencies of social existence? How can they permit him to spend decades on the back wards of our state hospitals, all but forgotten by relatives, while the stream of life goes on outside the institution? What purpose is served by the vaunted frontal lobes, if they reduce man to this degraded state, with behavior worse than that of the caged animals at the zoo? The frontal lobes? Pathological excrescences!

Let us examine the functions of the frontal lobes in their relation to psychopathology.

We have gone over in rather detailed fashion our concepts of function of the frontal lobes. Foresight and insight are the two functions of prime significance for the individual in a social environment. What, therefore, do foresight and insight have to do with the development of psychosis? How do they contribute to the demoralization that is characteristic of the early phase of psychosis?

We believe that the frontal lobes are ordinarily the seat of an extremely varied functional activity. We have shown how they are capable of directing the attention of an individual to the minute ramifications of a problem, how they bring to the individual a capacity to respond to an abstract idea. Given an individual who is faced with an

important decision upon which future projects depend, the thought and contemplation expended upon the proposition may be sufficient to fatigue the individual so that his powers of envisaging the whole problem become increasingly impaired. In a state of fatigue the capacity to synthesize is reduced and the individual is obliged to undertake the consideration of each element in the proposition, in turn, rather than many aspects simultaneously. At the same time, his capacity for achieving satisfaction with his solution is reduced, and he spends more and more time on a fruitless quest for the solution. With the lack of solution of the problem comes, at first, a vague and ill-defined discomfort, an emotional reaction to a problem that is not being solved as adequately as he thinks should be possible. The emotional reaction to the unsolved problem not only makes the solution more distant, but also tends to focus the attention of the individual upon himself, and he searches his mind for reasons why he cannot solve the problem that, under ordinary circumstances, should give him no particular difficulty. With the contemplation of the problem, the emotional charge becomes deepened, and the concrete attitude turns more and more toward the abstract. Instead of asking himself, "What shall I do next?" which has an answer, he says: "What shall I do?" And this question has no answer.

The frontal lobes, which give us the power to solve problems, also give us the power to erect new problems on the basis of the old that stretch too far into the abstract to permit of solution. The reaction to failure is with emotion that further upsets the normal balance of mental activity, leaves a decided feeling of frustration and an emotional surge that makes even tackling the same problem a difficult and unwelcome one. Instead of finishing up his thinking, the individual with intact, but (shall we say?) fatigued, frontal lobes continues his thinking beyond the useful period into the useless and harmful period in which blocking and indecision are the eventual outcome. A normal individual has a problem to solve. It may be easy, in which case a solution is quickly adopted and acted upon. It may be difficult, in which case prolonged thought may be necessary, but the solution is acted upon, and, if successful, there is the gratification that naturally follows. If the solution is unsuccessful, there is the usual disgust, with a determination to learn the lesson and do better next time. But, worse than failure, is the lack of any solution, for this leaves the problem where it was in the beginning with an addition of the knowledge of failure, and

possibly the result that no answer can be expected. The normal individual may recognize his inability to solve the problem, but the individual who is uncomfortably perfectionistic is not satisfied with this relinquishment and he tries again and again, with equally poor results and yet with an inability to give up contemplation of the problem. He remains hung up, *accroché*, as Janet says, able neither to solve the problem nor to abandon it, and the conflict and frustration increase the load of futility that he is already carrying.

The normal individual scans the situation with a certain philosophical resignation and admits that he isn't as clever as he thought he was. The individual who is becoming sick is not satisfied with a simple answer like this, but seeks within his own consciousness the answer to his failure. The problem which at first was only intriguing has become pervasive, something threatening, something malignant. He wonders why he cannot summon his mental powers to solve it and, in the hours of darkness, cannot relinquish the problem for the sleep that might clarify the situation. He spends his hours going over and over the situation making and unmaking decisions until he falls into the fitful sleep of exhaustion, with vivid dreams that do not bring the answer.

With continued failure to produce an answer, the sickening individual begins to examine himself (frontal lobes!) and to explore his mental processes, endeavoring to ascertain what is wrong with himself, meanwhile sinking more and more into a mire of self-directed thinking, from which he is roused with difficulty by his relatives. He shuts himself away from his friends and his family, gives himself up to the contemplation of himself, with steadily increasing emotional surges that lead slowly or rapidly as the case may be to a feeling of utter futility and frustration, with death as the only apparent solution.

The selective activity of the frontal lobes may thus be perverted and carry the individual through the throes of self-contemplation and self-transplantation into the future until self-destruction seems altogether logical.

As another example of perverted activity of the frontal lobes, we may cite a case in our experience in which a mild cutaneous eruption, occurring shortly after an emotional experience, was the precipitating factor in a syphilophobia that lasted for twelve years and was only relieved by a rather extensive prefrontal lobotomy. The case is given

in some detail in our monograph as an example of the manner in which a simple incident may be transformed by emotion into a disabling contemplation of the self and the future with all its horrendous potentialities.

Actually, it is our belief that the ideas developed in a neurosis or a psychosis are unimportant. Anybody may have a few crazy ideas. Which of us, when confronted with a local pain or swelling or eruption, does not cast about for an explanation? If the explanation is readily determined, the proper treatment is undertaken and the episode is all but forgotten. If the explanation is not immediately forthcoming, the individual, by means of his frontal lobes, goes back into his past for the possibilities, and forward into the future for the eventualities. Among our patients, and particularly among ourselves who already know what can happen, the most threatening prospects are the first envisaged. Tuberculosis, syphilis, cancer. These ideas are normal, they are natural, they are the product of a normally functioning pair of frontal lobes. The point is that the ideas developed in connection with the local disturbance are not fixed. They come and go, are changed around, and the less likely are discarded. When the solution comes and the future seems relatively clear, it is accepted, even though it may be an unfavorable one, and the attention is diverted into more profitable fields.

The difference between this reaction and the pathologic one resides in the fixation of the ideas. Egas Moniz particularly called attention to the fixation of ideas which he considered were in relation to relatively fixed constellations of neuron patterns, and which he believed could be broken up by prefrontal leucotomy. Taken in this light, then, the fixation of the ideas becomes dependent upon the interaction of the frontal lobes with the thalamus, the emotional component having the function, as it were, of fixing the idea. This fixation by emotion may be compared with the production of a photographic image. Following exposure of the sensitized film in the camera, there occurs a physical change in the emulsion which is not apparent until a reducing agent is applied. As the developer acts, the image is brought out, but if the developer continues to act the image fades back into obscurity. However, if, at the proper moment, a fixative is applied, the image retains its brilliance and neither light nor reducing agent will then be effective in changing it. Ideas are harmful not because of their strangeness or queerness, because anybody may

have a few strange and queer ideas. It is the *fixation* that renders them harmful; therefore, *fixation* becomes the criterion of psychosis.

Once fixation of ideas has occurred, the stage is set for further elaboration. This may be either along the lines of somatic preoccupations (hypochondriasis), intellectual preoccupations (obsessive states), or social preoccupations (paranoid reactions), or similar conditions. The full elucidation of the psychopathology of mental disorder is beyond the scope of our presentation. We would emphasize, however, the interplay of the intellectual and emotional components of the mental processes in terms of neural activity. The emotional reactions impose upon the behavior of the sick individual an ever increasing burden of abnormal ideation, until, with emotional deterioration setting in, there is gradual and progressive obliteration of all semblance of normal integration of frontal lobe activity. When this occurs the whole personality of the patient becomes degraded and only life remains.

Summary

The frontal lobes have many functions, but those which we have been able to demonstrate most conclusively are concerned with two very complex and personal functions, foresight and insight. When the frontal lobes are inactivated by an operation severing their connections with the thalamus, there develops a type of behavior that is quite adequate at the concrete social level. People with a satisfactory background who have not undergone too much emotional deterioration are able to maintain themselves quite adequately, and most of them can resume a constructive place in the community. They are lacking mostly in an emotionally charged attitude toward themselves and toward the future that is characteristic of the mature individual. While they are usually cheerful, friendly, unselfconscious, alert, willing and emotionally responsible in social situations, there is nevertheless a lack of adult dignity, of thoughtfulness, of sympathy, altruism and general helpfulness that we look for in an entirely adequate individual. Introspection is difficult and unprofitable for most of these people and they take life as it comes without too many regrets for the past or fears for the future. Only seldom does an individual step over the bounds of decency and reasonable self-restraint.

We are led to the conclusion from observation of a considerable number of people who have recovered following prefrontal lobotomy

that the frontal lobes are capable of considerable reduction without impairing the social effectiveness of the individual.

On the other hand, we may argue that under certain circumstances, the anatomically intact frontal lobes may undergo a certain perversion of activity in response to forces that are widespread and for the most part well understood. As a result of increased emotional toning probably supplied by the thalamic connections, the frontal lobes become fixed in their responses. Thenceforth, stimuli of various sorts coming to the consciousness of the individual may be considered as channeled through the abnormally fixed constellations of neuron patterns in the frontal lobes, resulting in abnormally fixed behavioral reactions. That the fixation is determined and continued by the emotional component is indicated by the altered reaction observed following the severing of the thalamofrontal pathways. The following sequence is regularly observed after lobotomy: first, the ideas lose their emotional potency; then the pathologic ideas decrease and disappear; and, finally, the motor component in association with the ideas, that is: the compulsions, the mannerisms and the tics, tend slowly to die out. Once the emotion in connection with the ideas is dispelled, the ideas lose their significance to the individual and the psychosis dies of inanition. The resulting personality is not all that could be desired, but it is considerably more adequate than that which persisted in the demoralized state associated with the psychosis.

Conclusions

The frontal lobes are the noblest endowment of man, essential for progress up the stages toward perfection of society. They furnish the individual with the capacity to see himself and to see into the future. If he sees steadily and objectively all is well. If he can see only himself, and if his vision of the future is colored by fear, remorse, shame, guilt and more fear, and, above all, if his vision becomes fixed, then the frontal lobes can lead him to psychosis and suicide. Without the frontal lobes, there would be no functional psychoses.

Discussion of the Paper by Doctor Freeman and Doctor Watts

By Dr. S. Bernard Wortis

This paper is a most important contribution to our knowledge of the functions of the frontal lobes in man. Race after race of man has

appeared on this earth, lasted but a short span of time, and then met disaster and extinction. Our modern race has persisted, because we have evidence that it differs in quality from its forerunners chiefly in its cerebral endowment. The frontal lobes have guaranteed modern advantages to man, brought him his spiritual understanding, his social attributes and his satisfactions from art and literature. Eventually, we all hope, world cooperation and recivilization will be the final achievement of the brain, especially the frontal areas. Tilney aptly spoke of the brain as the master organ of destiny, the cumulator of experience, the instigator of progress. These abilities of the human race are specially concerned with the frontal areas of the brain. We know, from all the evidence accumulated, that the frontal lobes are concerned with foresight, the capacity to project oneself in time and space, abstract thinking and social attributes with moral and ethical features, and insight with the capacity for self criticism. These superego functions, concerned with the interpersonal relations, have important relations with the frontal lobes.

May I remind you of one of the earliest patients with frontal lobe lesions:—one Phineas Gage, a well balanced, shrewd foreman of a construction gang who accidentally had a crowbar driven through his head, entering below his left malar bone and coming out between the frontal bones? He subsequently became "irreverent, profane, impatient of restraint, obstinate, capricious, vacillating." Later he had convulsions and died.

The frontal areas of the brain are large and represent large association areas. Intellectual function requires an immense number of association pathways, but joining specialized cortical areas. Normal, intelligent functioning, consists of an immense richness of conditioned responses. In frontal lesions, no special quality of behavior is lost, but there is a quantitative deficit.

Medical progress depends on much experimentation. Often the cure of a disease seems to have little logical relationship to the cause. For example, we give patients who have general paresis (syphilitic disease of the brain) another disease, malaria, to cure them of the paresis. Such therapy has little logical to recommend it. Why does giving a person a second disease cure an existing disease? In this light, it seems to me, we must evaluate frontal lobotomy. Is the surgeon justified in depriving a person of the most important part of his intellect in order to relieve him of emotional difficulties? We have heard

from Doctors Freeman and Watts that such patients after operation, are often lazy, undiscriminating, and have impairment of insight. True, some lose their obsessive worries, but at the expense of impairment of the highest integrations of their conscience or superego functions. It therefore seems to me that other less drastic therapeutic methods should be used first. The procedure of frontal lobotomy is more appropriately used in old chronically ill patients—especially those with prolonged agitated depressions who have not responded to other, less drastic, reversible treatment.

Frontal lobe function has both phylogenetic and ontogenetic significance. The infant, with little association frontal lobe development, has poorly developed superego functions; he socializes poorly, is egocentric. The normal adult has good frontal lobe function with some capacity to project himself into the future. This makes for social progress. The senile person has arteriosclerotic changes in the brain; he again becomes the asocial, egocentric individual who looks backward, not forward. So, you see, there is a development history of the frontal association areas.

The more important contribution of this work is the information it has given us concerning the functional significance of the frontal areas. I am certain I express the opinion of this group when I tell Doctors Freeman and Watts, we have enjoyed their most stimulating scientific contribution to basic neurophysiology.

SECTION OF ANTHROPOLOGY

MAY 22, 1944

DOCTOR JAMES W. WOODARD, Temple University, Philadelphia, and Queens College, Flushing, N. Y.: *The Role of Fictions in Cultural Organization.*

The viewpoints presented in this analysis have slowly emerged over twenty years of teaching and protracted mulling over of the areas concerned. Into it have gone many items from sociology, anthropology, and psychology; and endless filtering of one's own experience through his categories, with resulting modifications, supplementations, corrections, and occasional dearly-bought illuminations. For such a "synthetic distillation," descriptive material is necessarily used for its expositional value, rather than for proof. The validity of the analysis is testable against the reader's own experience and background, and the reader will be a qualified critic to the extent to which (and in proportion to the background, experience, and maturity with which) he has been carrying on a somewhat similar attempt to synthesize these chaotic materials. If there are main sources and derivations, they probably lie in the work of Sumner, Max Weber, Wm. James, Freud, Adler, Vaihinger, Durkheim, Marx, Malinowski, and Veblen, a motley array, somewhat recalcitrant to synthesis, but alike in their functional approach, and in cutting below the surface of things to show us things-as-they-are. The work of other writers, Cooley, G. H. Mead, Horney, Fromm, Pareto, Benedict, Waller, etc., would also have relevance to such a synthesis as is here attempted. The seriation—folkways, usages, conventions, mores, and institutions—is a needed improvement in precision over Sumner's vaguer, less discrete, and more inconsistently used folkways-mores-institutions seriation. The "as if" of Hans Vaihinger, the "life lie" of Adler, the pragmatism of Peirce, James, and Dewey, and the functional-processual approach of Freud, Marx, the functional anthropologists, and all the writers just named are reflected in the stressing of the importance of these principles in phenomena at the societal level of abstraction.

The structures and processes of society must be functionally approached if they are to be understood. Society carries its "as ifs," fictions, and "life lies," things that are not objectively true, but belief in which is vital for the retention of the given societal integration. Vital

"beliefs" or "functional truths," one might call them as over against "objective truths." For, however much the pragmatic criterion must be set in the perspective of other criteria for the purpose of philosophy and science (and *eventually* for life itself for that matter), the naively carried on societal process, like that of the individual organism, does seem to carry itself along on pretty much of a pragmatic basis—in terms of what works (or seems to work) from the center of reference of the functioning unit concerned.

Thus, there is much control by illusion—by myths, legends, biases, rationalizations, fictions, and outright lies—which will not stand the scrutiny of objective truth. The full implications of this; the necessarily referential and relative character of meaning itself; etc.; these things would take us far beyond the spatial limits of the present paper. And we bespeak the reader's indulgence if we seem to touch too lightly or too superficially on some aspects of our study. Also, we should like to make clear that we are not discussing the role of fictions in all areas of societal phenomena—the myths, biases, and legends of social organization and the social process, for example—but only in the area of the cultural organization. Even here, we have further limited our analysis. For we shall not discuss the fictions of the inductive culture —the abstractive fictions and fictional constructs of science, with its light bullets, electrons, endopsychic censors, typologies, etc.—nor those of the appreciative-expressive culture—the "let's pretend" of all play, pageantry, drama, and fiction, the formalization of representational aesthetic motifs, etc. We shall limit our discussion to the fictions of the control culture itself. And we shall treat the control culture *as* culture. Thus repercussions relative to class structure, class struggle, war, revolution, the social process, etc., will also be slighted. We hope the reader will be aware of these failures of inclusion, but will remember that we are spatially limited and that many of them would be taken care of in a statement of our full analysis.

Almost all social and cultural structuration and processing derive from the paradoxical nature of group living, as such. On the one hand, the social "units" are wrapped up in their separate skins; they have their separate centers of reference for meaning and value; hence they pristinely and persistingly tend to go off at their separate behavioral tangents. Yet such intransigent units must somehow be conformed to at least that minimal uniformity of behavior and belief requisite for group living. For the possession of minimal ready-at-hand patterns of

behavior and belief is an inexorable situational necessity in the nature of group living. This is true in order to (1) economy of time and effort, (2) survival in a crisis, (3) a framework of predictability for intra-group behavior, and (4) a framework of meaning and value for the development of those consistencies in habits of thought and action that make possible the integration of the individual personality and character within its societal milieu. These are universal situational imperatives. In terms of them all groups everywhere always have *an* order, a *status quo*, a *cultura qua*. *Which* order, whether polygyny, polyandry, monogamy, etc., is another matter. But no group can remain a group without *an* order of minimal uniformity of behavior and belief to which its pristinely tangential units conform.[1]

It is obvious that this whole spontaneity-conformity problem will alter depending upon (1) whether a given item is vitally *important* (or so considered) or relatively *unimportant* from the center of reference of the group; (2) whether the individuals show *acquiescence* or *resistance*, i.e., whether individual tendencies spontaneously approximate a consensus or whether they have to be in some way brought into conformity; and (3) whether culturally carried patterns are *provable* or *unprovable* to the individual mind as to the utility of the behavior or the truth of the involved beliefs. For only to the extent to which spontaneous consensus or rational proof are not available will recourse have to be had to disciplining, persuading, hoodwinking, or forcing. If the matter is of no importance to the group in terms of the four functions of uniform patterns mentioned above (i.e., economy, survival, predictability, etc.), individuals may be permitted to do as they please. Any cultural patterning in such an area will tend to occur spontaneously and without coercion or rationalization, the patterns being followed because of their common enjoyability and realizational appropriateness. This results in the *appreciative-expressive culture*, made up of

[1] There is nothing mystical in such functional concepts as situational imperatives, situational emergents, and the like. The cause-and-effect instrumentation of such concepts consists: (1) at the biological level, in fluctuations and mutations and their role in meeting the imperatives of survival; (2) at the physiological level, in fluctuations and mutations plus the physiological gradient, chemical balances, and other "organismic" modes of adaptation; (3) at the psychological level, in fluctuations, mutations, and physiological modes of adjustment, plus the alterations in conditioned response patterns and in gestalt formation through trial and error and covert trial and error (intelligence); and (4) at the social level, in the biological, physiological, and psychological adjustive potentialities, plus the patterning and repatterning of converging social pressures and the crystallization of experience, which give rise to social and cultural patterns. At all these levels, there are failures and errors as well as successful trials, so that imperatives are not always met or fully met. But (1) the developed organism, established species, and enduring society has had to reflect them in the very character of their structures and processes. And (2) they are present factors in the understanding of failures, species-extinction, etc. Thus, situational imperatives are factors showing certain uniformities in their effect-*tendencies*. This is of the essence of scientific description. As such, they are scientifically abstractable and describable.

the recreational forms, sociability forms, folk dances, folk art, folk music, pure art forms, schools of cookery, and the like, which are done for their own sakes on an end-in-themselves basis. Where there is objective proof available as to the utility of the behavior pattern or the truth of the involved beliefs, then there will slowly emerge an area of the culture characterized by experimentalism, skepticism, and rational means-ends procedures. This is the *inductive culture*, made up of the tools, devices, and machines, the supporting skills and techniques, the accompanying background of factual and theoretical knowledge which eventually make up the sciences, and the underlying methods of achieving certitude: logical demonstration, experimental proof, statistical and causal analysis, etc. But where matters are important to society, where the pristine individual tendencies are obstreperous and at variance, and where there is not (or not as yet) possibility of inductive proof bringing a rational consensus, then society must do as the individual does in a similar circumstance. It must raise its voice, become insistent, intolerant, and dogmatic, and through cajolery, emotional persuasion, moving pageantry or ritual, the pseudo-logic of rationalization, stigmatization, fictions, rewards, or force, produce the required conformity. There then results the *control culture*, made up of the prescriptions and taboos, the customs, traditions, and laws; more specifically, of the folkways, usages, conventions, mores, and institutions, together with their supporting fictions, ideologies, rituals, institutionalized roles, and so on.

There is much to be said of these three parts of the culture and their relation to each other.[2] There are strains between them. Necessarily, the control culture dominates the entire culture at early points in cultural evolution. And it yields ground grudgingly as the inductive culture slowly undermines it, assimilates it, and alters its character, thereby winning release for itself and for the appreciative-expressive culture to carry out their own contained imperatives. In advanced cultures, quite divergent emotional-intellectual "climates" come to pervade these three divisions. This might be typified by the contrast between a Bohemian artist in his artistic sub-group, a research scientist in his scientific sub-group, and a bishop, humanitarian, or grand inquisitor in his moral-religious sub-group. They throw up their diverging immediate aims and developed, contained ideals. The inductive culture represents the reality principle. Utility (e.g., the provable

[2] See James W. Woodard, "A New Classification of Culture and a Restatement of the Culture Lag Theory," *Amer. Soc. Rev.*, 1 (1): 89-102.

utility of a steel knife over a bone knife is its immediate aim. Truth is its developed, contained ideal. The appreciate-expressive culture represents the pleasure principle. Enjoyment (as in a folk dance or a ball game) is its immediate aim. The integrative harmony of the fully creative and realizational, the beautiful, is its contained ideal. The control culture represents the moral principle. Conformity to the already given moral order is its immediate aim. But it holds a contained strain from tribal, authoritarian morals toward a welfare ethics. The social good is its contained ideal. Each division adopts the fiction that its own ideal really contains the other two, that it is the preeminent "way of life" for the group. Thus, there are strains, conflicts, and endless accommodative devices and resultant processings. But there are also strains toward synthesis.

This structure of culture parallels the structure of personality.[3] The moral-principled control culture and the moral-principled *super-ego* alike reflect the pristinely repressive, situational imperatives of group living, with its group center of reference for meaning and value. The pleasure-principled appreciative-expressive culture and the pleasure-principled *id* reflect the realizational strivings with their individual center of reference for meaning and value, while the inductive culture and the *ego* reflect the reality principle of impersonal reason —the impersonal and deracinated reference for meaning of the natural order of cause-effect reality. Of course, the overlappings and repercussions are far more complex than this simplification would indicate, for all of these factors are pervasive and permeate all areas both of culture and personality to some degree.

The points of interest to us in the present discussion are as follows: First, this is a functional classification of culture. The occurrence and characteristics of structures are understood in terms of their functions. This funtional approach we shall carry with us to the further analysis.[4] Second, we have seen the divergence of three centers of reference for meaning and value (the individual, the group, and the impersonal and deracinated descriptions of objective science) reflected in the threefold structuration both of culture and of the personality. Finally, it is evident that the strain between these divergent definitions of meaning and value will be at its greatest in the control culture. This portion of the culture owes its existence, structuration, and characteristics

[3] See James W. Woodard, "The Relation of Personality Structure to the Structure of Culture," *Amer Soc. Rev.*, 3 (5).

[4] On the functional approach in the social sciences, see James W. Woodard, "Social Psychology" in the forthcoming volume, *Twentieth Century Sociology*, Georges Gurvitch, Ed.

to the necessity to accommodatively reconcile that strain. We now turn our attention more specifically to the control culture.

It is obvious that not all prescriptions and taboos are equally insisted upon. In our own group, for example, it is rather heavily required that one not commit grand larceny or murder, rather lightly required that one eat his peas with a fork or tip his hat to a lady. This is obviously because so much depends, from the standpoint of other group members, on the former, so little on the latter. But the insistence also measures the resistance. For neither does it cost the individual much by way of discipline or self-sacrifice to eat his peas with a fork rather than a spoon; whereas to starve rather than steal, to go loveless rather than violate the chastity mores, or to curb the murderous impulses of rage and jealousy require a great deal of discipline and often considerable self sacrifice. The group will not have to insist if the individual acquiesces spontaneously, and the individual will acquiesce readily if the cultural pattern accords with pristine spontaneity anyway. Thus, somewhat like over-protestation and defense mechanisms in the individual personality, great insistence, intolerance of questioning the moral frame of reference, and elaborate supporting rationalizations and ritualizations measure not only the imputed importance of the pattern to the group, but also the extent and, to some degree, the natural-order legitimacy (from its own center of reference) of individual resistance.

Just as, in economics, the intersection of the lines of supply and demand determine price, so here the intersection of the group's insistence and the individual's resistance determine where the particular culture pattern will be located on the scale of folkways, usages, conventions, mores, and institutions. A somewhat similar heuristic graph could be made use of by sociology. And, since a pattern may lie at any point in the important-unimportant scale or at any point in the acquiescence-resistance scale, it is evident that folkways, usages, conventions, etc., are not sharply discrete, but that they merge imperceptibly into each other. They are abstractive constructs arrived at in the course of functional analysis, not empirical types arrived at by statistical multimodalities of their scattering along the total range of behaviors. But, while they merge

imperceptibly into each other, at each point where we have added a new concept, significant new characteristics accrue. This we shall see.

At the *folkways* level, e.g., as we here more sharply delimit the term, there is no divergence between the three centers of reference for meaning and value already mentioned. We may take the culture pattern of the siesta in the tropics as our type-example. The group does not insist. The individual does not resist. A *functional* science, such as physiology, would stamp the behavior as functionally appropriate behavior for an organism such as man in an environment such as the tropics. Desire and duty do not clash with each other nor with truth. There is no resort to fictions, supernatural sanctions, illusion, bulldozing, or force by the group; and no hypocritical pretense or personality conflict on the part of the individual. Emotion, reason, and behavior fully buttress each other. The good, the true, and the beautiful are one. Man, at one with himself, is at one with his society and with his universe. The ideal-goal of ethics, psychiatry, and the social sciences (as functional sciences) is to reduce the totality of human-social living to this sort of contained harmonious integrity.

As we shall see, this is not really possible, though it could be approached as a limiting upper asymptote of human adjustment, so to speak. But the initial paradox contained in social living (of tangentially inclined entities with a skin-contained center of reference having to adjust to a social-cultural order with its own center of reference) makes it inevitable that, on more important matters requiring greater individual discipline or frustration, the three centers of reference diverge more and more. This could be represented graphically by a curvilinear γ plus a central column, each line of which represents one of the situationally diverging centers of reference for meaning and value. Let the central line represent "objective" meaning and value, as determined by a developed functional science. Let the left-hand curve represent meaning and value from the pristine center of reference of the individual; and the right-hand curve that from the center of reference of the group.[5] At the folkways level, the three lines

[5] Like the neural-arc diagrams of psychology and neurology, this is necessarily vastly oversimplified; e.g., there are as many left-hand lines as there are individuals in the group; and they would have to be inter-threaded with their various sub-groups in turn, each of which (e.g., a sub-cultural area or level, a family, community, or interest group) has *its* center of reference also, which only partially corresponds with, and partially diverges from, that of its constituent members and that of the total society.

are one (redolent of the Trinity symbolism in Western culture!). But they diverge more and more as we go from folkways up the "ascending scale of self-consciousness and compulsiveness" to institutions. It becomes the business of the control culture to make the individual act "as if" only the group's line of reference had validity. This it may do by denying the essential validity of meaning and value as defined from the other lines of reference; and/or by admitting the situational disparities and/or then securing compliance by compensating psychic rewards, "spiritual" values, and the like and/or other modes of reward and punishment up to promises of eternal life, inquisitorial force, or the threat of hell fire.

We have taken the siesta as a type-example of the folkways. The reader can readily supply other examples, and from various cultures, such as the pattern of sitting on the front porch in the cool of the evening, as in the hill-billy South; of the social call accompanied by tea and gossip as in Scandinavia; of serving applesauce with roast duck, etc. Such folkways are as comfortable as old shoes. They are so appropriate that often they have had a syncretistic growth, being true "group habits." Members of a culture are sometimes scarcely aware that they follow them until, going to another group, they realize that there different folk "ways" are followed. The folkways thus merge imperceptibly into the appreciative-expressive and inductive cultures. The same realizational and rational appropriateness is permissible in them, and the same absence of constraint or *prescribed* fiction. Deviation from them is permitted, and the group regards the deviator with a whimsical indulgence. They merge imperceptibly, however, into the usages. For if there is present some arbitrariness of insistence upon the precise "way" of the given culture, we approach usage.

In *usages*, the first fictions appear. One must act "as if." This is often an implicit fiction; and, as the usages level, it is only an arbitrary fiction, not a directly false one. We may take the pattern of eating peas with a fork as our type-example. Now we could really eat peas with a fork, a knife, a spoon, a tablespoon, drink them out of the edge of the dish, or pick them up with our fingers. But we have to act "as if" only the fork were the "correct" or "proper" way. Thus, there is an implicit fiction in the usages. But we do get peas that way. It isn't as if we were required to eat consomme with a sieve. It is thus only an arbitrary fiction, not a directly false one, at the usage level. Except for some training in, or catching on to, tribal ways in childhood,

correct usage can become as automatic and unselfconscious as the folkways. They cost the individual little, and are little resisted by him. The worst the group will do to the violator is to laugh at him as a ridiculous person, for no one in the group is appreciably hurt by violations. The insistence-resistance lines cross at a point scarcely above the folkways on our total scale of patterns. But, because of the existence of a fiction (if only a tiny and arbitrary one), the three lines have begun their divergence. Personal caprice might lead me to play at eating my peas, plopping them into the air as children do with jelly beans, and making something of a zestful game of catching them in my mouth. An efficiency expert might well show that the spoon is the most expedite, safest, and most aesthetically acceptable instrument for eating peas and conserving at the same time more of the juices. But the group disregards both of these and prescribes the fork as the only "correct" and "proper" instrument.

It is the tiny, initial divergence of the three lines of appropriateness-reference. Because it is so tiny and meets us so ubiquitously, it is probably vastly important in setting the pattern of unquestioning acquiescence in more vital matters. For the extent to which usages permeate every aspect of our living is constantly marvelled at by those who study them—this fork for the oysters, that spoon for the demitasse, a notch in the lapel, three buttons on the sleeve, this costume for the beach, that tie for formal occasions, white wine with the fish, and so on endlessly. In addition, there is the tremendous utility of the usages of predictability and of communication—to the right in traffic (though on the continent they act "as if" to the left were "correct"), a red light for stop, a hand-shake or rubbed noses to indicate cordiality, doffed headgear to show respect, and the sound sequence, p-e-n-c-i-l, to indicate the object I am holding. All gestures, units of measurements, vocabularies, and all syntax are thus elaborate and sometimes systematized fictional constructs, parts of the group's usages.

There is no *objective* basis for any of these meanings. But by all acting "as if" they were true, *we make them become true* (i.e., functionally true, within our cultural frame of reference). Thereby, we achieve tremendous predictive and communicative gains. We thus get a glimpse of the creative aspect of societal fictions. Also we gain insight into the control culture's intolerance. For unless all act as if the fictions were objectively true, they lose their *functional* truth. Conformity thus has its creative, and individuation its destructive aspects!

This is a point over-emphasized by the conservatives of any given *status quo*. It is apt to be underestimated not only by the rebel, but also by the Freudian, the cultural relativist, and the hard-boiled scientist.

This creative aspect holds true on up our scale of patterns. At the mores and institutions levels, the group creates rich moral and spiritual values of great meaning-resonance to bridge the there widened gap between our diverging lines. That these sometimes completely lack objective validity must be put in the perspective of their functional vitality. In our contemporary Western culture, the old frameworks at these levels are rapidly disintegrating, and new ones have not yet been found. The functional sciences must develop their subtle techniques so that one day we may separate legitimate from spurious fiction and validate appropriate ethical and spiritual values inductively—for all men and all cultures. For though the coalescence of the diverging lines remains an ideal-goal, their divergence is situational, and the resulting strains are natural order phenomena. Balances must be determined. Gaps must be bridged with recompensing psychic meanings. But such meanings must eventually meet the imperatives of all three of our diverging lines. They cannot indefinitely remain pumped-up over-protestations of a single line of validity, coercively enforced. They will always be subtle and complex meanings of great intellectual and emotional resonance. But, as in the individual personality, deviousness (or the lack of it, simplicity) is in itself no measure of adjustment.

Already, at the usages level, we see the inevitability of fictions. If we did not act as if some one way (whether to the right or to the left) were the only "correct" way to turn in traffic, what a mess we would be in. If we limited our vocabularies to words that truly had an objective relationship to their referants, we would never get beyond "bow wow" and "cuckoo." It is when language frankly embraces the fictional principle in the arbitrariness with which referants may be assigned, that it is set free to realize its potentialities as a plastic communicative tool.

In some areas—vocabulary, gesture, etc.—the societal fictions *may* be completely arbitrary. (We show respect by removing the hat, the Hebrew by leaving the hat on, the Mohammedan by removing the shoes. Twiddling the fingers while thumbing the nose could equally well be used, *if* a group agreed to act "as if" that indicated respect.) There is no question but what a certain potential arbitrariness carries

on to the patterns higher in our scale, though within sharper limits, as more vital factors are concerned. But quite absurd mores and institutions, once thoroughly established, show a remarkable vitality, and are made part of a going societal integration.

Not that, even at the usages level, more appropriate fictions than those used cannot be discerned. A tribe that tells directions by upstream and down-stream (somewhat as we come to speak in terms of uptown, downtown, and cross-town), or which tells time in terms of the reign of its chiefs, might better (at least after contact with the external world is established) use the less tribal and more nearly universal communicabilities and predictabilities of the points of the compass and the movements of the sun. The establishment of a global culture at the usages level, fictions and all, should not be too difficult. It would be highly desirable in the more important of them, such as a *lingua franca*, common currency denominations, units of measure, calendar, etc. The fictions of a decimal system have an obvious advantage over more cumbersome systems, and it would not be hard to improve on our present calendar. Thus, when we note the functional "truth" of fictions within their cultural frame of reference, we should not confuse this with full functional appropriateness. Many ethnocentric prejudices are functional "truths," in our use of the term, without being fully adjustive in their functional significance. Some are even maladjustive. When refinements can coalesce our diverging lines or establish a better harmony between them, the involved fictions are preferable to the old ones, functionally, even if they are no more "true" than those they replace.

We see from the usages that the group will accept truth or fiction with equal ease, on a pragmatic basis, depending upon which works best, even if the fictions involved are absurd, nonsensical, and quite impossible. Take the usages of time, for example. It is, let us say, either the same time at all points in space at the same moment, or else (taking the sun as a point of orientation) time differs inch by inch as we go from east to west across the map. But neither of these is a wholly *feasible* truth. For the one would give you all degrees of daylight, twilight, and darkness by the same verbal symbols; and the other would require you to carry calculus tables with you and go through endless computations to keep the simplest appointments. So we compromise. We act "as if" time stayed uniform through a given stretch of the map. Then it jumps a whole hour. After another stretch of distance, it jumps another hour. At a given point it jumps a whole

day; so that one could stand there and jitter-bug back and forth into yesterday, today, and tomorrow. Absolute nonsense, absurd, and impossible! Yet we are sure that none of you will have such a high regard for objective truth as against functional fiction that, after reading this, you will smash your watches and start carrying calculus tables. Objective truth is greatly over-estimated by scientists and philosophers who reify and absolutize the inductive culture's contained ideal. What good is objective truth to a functioning entity if fiction will work better? It is because fiction will not always work better, and objective truth therefore comes to have a long-run adjustive, workability value, that objective truth was ever given importance by intelligent organisms and societies—and very reluctantly!

The human and social sciences, as concerned with functioning entities and functional structures and processes, will certainly have to elevate the analysis and understanding of fictional "truth" to a par with their quest for objective *truth*. One of the objective truths which they will discover is that functioning entities go along largely on a trial-and-error, pragmatic or workability basis in the process of adjustment-seeking and realizational striving. Lashley and Franz discovered this at the neurological level in the equipotentiality and vicarious functioning of the neural organization. Thorndike discovered it in the "success" factor in learning. The gestaltists have discovered it in the perceptual process. The psychoanalysists have discovered it in the "life lie" and numerous other mechanisms. It is time the social sciences realized the full import of the pragmatic-functional principle in social phenomena.

Thus, from the usages we have learned (1) the inevitability of the use of fictions to gain social predictabilities, economies, communicabilities, and uniformities; (2) their potential sky-blue arbitrariness; but (3) their susceptibility to correction and refinement in terms of smoother functional appropriateness; (4) the preferability of obviating fictions where it does prove possible to "coalesce" our divergent lines; (5) the pragmatic basis on which societal fictions are adopted and hence (6) tend (because of the relation of "workability" to learning and to perception) to be reified as objective truths; and (7) the creative, enriching, and realizational potentialities which fictions carry, along with (8) their stultifying, blocking, and maladjustive potentialities. All of these things are also true of the fictions involved in the patterns higher in our scale—of conventions, mores, and institutions.

Their significance becomes at once graver and richer as those more vital areas are concerned. But it is well to see these things first at the usages level, where we can still be relatively detached and objective in our analysis. For objectivity is no less important in functional analysis than in the analyses of inorganic science.

We shall find that the discoveries made at the usage level hold good on up the scale, with successive accretions at each step which hold good in turn, etc. Thus, there is a usage *aspect* to conventions, mores, and institutions; also conventional aspects to mores and institutions; moral aspects to institutions, etc. For example, take the usage aspect in institutions, namely the involvement of an arbitrary "as if." Just as one could eat his peas with a fork, a knife, a spoon, a tablespoon, etc., but the cultural pattern requires that he act as if only the fork were the proper instrument. We now know, thanks to history and anthropology, that a group may have a perfectly workable order based on monogamy, polygyny, polyandry, concubinage, and so forth; but a given culture requires its members to act as if only monogamy, for example, were proper. Similarly, it might have private property, kinship property, communal property, etc.; or autocracy, democracy, oligarchy, dictatorship, etc. But we are required to act "as if" only private property, or only democracy have validity. And since much more important matters than the eating of peas are involved, the conformity insistence is so much the greater. We do not imply that the formation of institutional patterns is ever as unrestrainedly arbitrary as the usage patterns can sometimes be. But the recognition of their usage aspect is a good way to clear the ground for functional appraisal of them. It opens the door to the possibility that developed expert appraisal might, some day, indicate an institutional "spoon" as really more appropriate for us than the sacred "fork" we all revere and idealize.

At the *conventions* level, a directly false "as if" is involved. Here, for the first time in our scale, the lines diverge sufficiently that one may refer to a conflict of interests between group members being involved. It is important for anarchists, followers of Rousseau, and those who over-emphasize Fromm's spontaneity principle to see that, even where, as at the usages level, no intra-group conflicts of interest are involved (or even if one assumed an Utopian heart of gold in every group member), the artificialisms, disciplines, and restraints of the usage fictions would still be necessary in terms of the predictabilities and communi-

cabilities necessary for group living. But if there is some strain between spontaneity and total-group needs, there is no involvement of intra-group conflicts between specific persons in the usages. At the conventions level, however, potential personal antipathies and clashes intrude for the first time. The conventions are thrown up as an accommodative device to handle them and keep them within bounds. The conventions thus reflect a higher degree of both insistence and resistance and a wider divergence of our three lines of meaning reference. They thus come a step higher on our scale, and necessarily resort to a greater fictionalization of behavior in consequence. These are interpretive principles to carry with us in our further analysis. For we shall see that mores and institutions are accommodative devices thrown up to handle still more vital conflicts and obstreperous impulses; and, in consequence, they make recourse to still greater degrees of fictionalization.

The directly false "as if" of the conventions may be illustrated by the type-example of a guest leaving a party which he hasn't enjoyed. Let us assume that he didn't want to go in the first place, but it was his boss who was giving the party, and his boss is a great bore socially. They played bridge, which he detests; his partner kept trumping his aces; the wine was flat, the jokes corney, and the sandwiches mouldy; and the hostess had halitosis. Now, he is at the door, saying goodnight. What *must* he say? Explicitly or implicitly, he must carry out the directly false fiction that he had a lovely time, is glad he came, and hopes to come again soon. And, though the host only invited him for conventional rather than spontaneous reasons and was himself bored stiff by the whole affair, he must respond in kind, "I'm so glad you could come. It was a pleasure to have you. Do come again soon." And if he hopes never to see the guest again, he just might add, "Don't wait for an invitation. Come any time." Thereby he warns the guest that he will not receive further invitation, but permits the face-saving interpretation that the lack of them derives from social closeness rather than social distance.

For the language of the conventions is devious. But, as we have seen, deviousness is not in itself an index of adjustive inappropriateness. The tribal member must learn to thread an intricate way among the deviousnesses of the tribal conventions. It is a blunder, ranging from comic boorishness to pathetic or really tragic consequences, to take the conventions at their face value. Functional truth and ob-

jective truth, from here on up our scale, are often exact opposites. Straining at exact-science objectivity in these areas thus become stultifying. Recourse must be had to the methods of insight, convergence of inference, and functional analysis.[6] The social psychologist, sociologist, and anthropologist have to distinguish between (a) the objective conventional response and what is actually communicated, at the conventions level; (b) the ideals or professions and the actual practices and counter-mores, at the mores and institutions levels; and (c) between even the achieved practices in turn and the frustrated and repressed tendencies still active below the surface. These problems are especially difficult for the anthropologist, who must know the language, live in the group he is studying for a considerable period, and bring a sufficiently sophisticated sociological, psychological, and psychiatric background with him to be aware of all the nuances of what really goes on. In these terms, considerable tenuousness must be attached to anthropologists' social psychological and social psychiatric findings, even quite recent and sophisticated ones, and even those worked out in collaboration with the psychiatrists. Anthropologists are becoming more aware of these hazards. Sociology is a little slow in catching up its methodological lag.

Volumes could be written on the ubiquity of the conventions and the extent to which they infiltrate into every aspect of social living, from the closest intimacies of friends to the widest ranges of society; from the triviality of a polite response to the gravity of a diplomatic announcement upon which world peace itself might hinge. Someone steps on your toe, says they are sorry (though they are not), and you respond that it didn't hurt at all (though it did). A cabinet minister is really fired, but receives an elaborate congratulatory letter on his splendid services and expressing hope his ill health will not be of long duration. If you had decided life was meaningless and were on the way to the river to end it all, and a friend greeted you with "Hello, Jim, how are you?" you would probably respond, "Fine, how are you, Joe?" and go on and jump in. A whole civilization acts for centuries as if women didn't have legs or as if there were no such thing as sex, leastwise not in the family situation. And so on, endlessly.

The functional character of conventions may be seen by taking our type-example and assuming spontaneous responses instead of conven-

[6] See James W. Woodard, "Five Levels of Description of Social Psychological Phenomena," *Sociologus*, 9, 1, 25-31.

tional ones. Our guest informs his host that he has had a lousy time of it and hopes he will never have to come again. Whereupon the host retorts that he only invited him out of courtesy, because he was a relative of his wife's, and that whole branch of the family are nothing but a bunch of jailbirds anyway. From that point, things begin to happen —disruptive quarreling and feuding, or the breaking off of further social interaction between the two. Thus, the conventions are accommodative devices (a) to enable the continuance of social interaction and (b) to keep the surface smooth in spite of underlying tensions. Their function is the *raison d'etre* of their existence and their characteristics. Mores and institutions are similar accommodative devices to hold even more divisive and intransigent strains in bounds.

The occurrence and types of conventionalizations can be predicted in terms of their functions, as thus described. Empirical observation will bear out such *a priori* analyses. Thus, the degree of formal conventionalization of social interaction will depend upon three sets of factors: (a) the importance (+) or unimportance (—) of continuing interaction and of maintaining smoothness of interaction; (b) the number and intensity of strains and conflicting interests which threaten to disrupt interaction; and (c) the number and intensity of spontaneous bonds, whether in interest or affection, whose existence obviates the necessity of recourse to formal conventions for cohesive smoothness. In terms of (c + to c —) for example, conventionalizations slough off as two people get better acquainted and become closer friends. Their relation changes from a conventional to a personal relationship. If one wishes to avoid having a relationship become personal, he retains the conventional forms of interaction. Or if a personal relationship becomes strained, a retreat into conventionalized interaction often occurs; and sometimes this bridges the period of strain smoothly enough to save the relationship. For conventions are depersonalizing devices, as any device must be which is to accommodate diverging centers of meaning-reference. It is to this depersonalization that they owe their efficacy. One acts "as if" one's personal reaction did not exist. Thus, the extent of conventional formality is a measure of social distance. Razzing, e.g., is usually a sign of social inclusion rather than exclusion, its functional character being the reverse of its superficial or "objective" appearance. There are far fewer formal conventions in primary groups and rustic neighborhoods than in secondary groups, at the king's court, or in cosmopolitan circles. Overlooking the relativi-

ties of appropriateness, poets and moralizers have often idealized, and clergymen are constantly nostalgic for the simple honesty of rustic ways by comparison with the more devious urbanities of the latter groups.

We have accounted for the three-fold structuration of the culture in terms of the combinations and permutations of three sets of factors: importance-unimportance, acquiescence-resistance, and provability-unprovability. And we have accounted for the ascending scale of patterning within the control culture in terms of the combinations of group insistence and individual resistance, the increasing divergence of two of the lines of meaning-reference. In the same way, characteristic changes occur in the patterning of the conventional fictions with every combination and permutation of factors (a), (b), and (c) in the preceding paragraph. Space does not permit full elaboration, but we may take one or two examples. There are (b +) many rivalries, personal animosities, and clashes of interest in a university community. At the same time (a +), it is important that relations between the president, the deans, the department chairmen, the teaching staff, and the student body never be broken off, but be kept as smooth as possible. Personal reactions must be subordinated to the imperatives of the institution and its functions, resulting in a hierarchical order of conventionalizations and social distances within the university community. A teacher should show a personal interest in his students, but it must never become *really* personal—to the extent, say, of quarreling or discriminatory flunking on the one hand or overt expressions of affection on the other. One does not say, in faculty meeting, "Professor B is a stuffed dodo and ought never be entrusted with the chairmanship of this committee." He says, "We have the highest regard for Professor B, and think he would be an ideal chairman; but in terms of precedent, etc., etc., we think the chairmanship should be vested this year in Professor A of the X department." Students may achieve a relatively spontaneous and frank interaction among themselves and academic colleagues may approximate that. But each such stratum in the university community is insulated in some measure from every other one by a host of conventional fictions and depersonalizing and social-distance-maintaining devices. This is extremely stultifying, but equally necessary, at least in some aspects. God help the university teacher who ever tells either his students or his superiors what he really thinks! One might think that a faculty reception, the assemblage of so many

brilliant minds and creative thinkers, would be a most stimulating occasion. It is perhaps the stuffiest occasion known to man.

The conventions do not entirely inhibit aggressive reactions. Sometimes they instrument them. A lifted eyebrow or a modulation of the voice can inflict a more exquisite wound within the conventionalized framework than the frank smash on the nose or fishwives' hair-pulling that occur at less refined cultural strata. The relativity of personality in the same person can be seen, too, in his contrasting behavior at a formal occasion, at church, on a pleasure cruise, at business, or in a crowded subway. For different fictions are imposed, and followed out, in these different groups, in accordance with their different conditions, societal functions, and contained imperatives. In the subway, for example, (a —) there is no particular importance in continuing interaction or in keeping it smooth. That particular combination of persons will probably never be together again anyway; and (c —) there are very few spontaneous bonds. Therefore, subways do not throw up many conventions of their own. They get along on the good breeding which seeps into them from the general society. This tends to degenerate into bad breeding in the subway climate, since the organic supports for good breeding are there lacking. Accordingly, (b) the only item of strain, the desire for seats and standing room, comes quite frankly into the open. We have seen the very same person who was so much the soul of courtesy at the faculty reception that you would think it was a pleasure and an honor to have his toes stepped on, become the soul of boorishness only a few moments later in the subway, "Whadda ya want, the whole car?" On the pleasure-cruise, (a —) there is not much importance in continued interaction and its smoothness, for few will meet again after the cruise is over. (b —) There are also few conflicting interests, and these are of low intensity. The pleasure-cruise, too, gets along on the good breeding that hangs over from the general society. But this alters in the new climate in the direction of the permissible release of (c) the major common interest, enjoyment. Hence, the pleasure-cruise, like the night-club, the annual convention, and the New Year's Eve celebration, tends to set up its own fictions and conventions—amoral or immoral from the standpoint of the general society—the mores of dalliance (the summer flirtation) and the conventions of irresponsible enjoyment. Anything goes.

The extreme of formal conventionalization is of course found in

the situation where (a ++) it is of life-and-death importance that interaction continue and smoothly; (b +) there are many conflicting interests and obstreperous urges threatening disruption; and (c —) there are few or no spontaneous bonds. Of course such importance, conflicts, and resort to formalism carry us beyond simple conventions to the conventional *aspects* of institutions. The military fighting unit answers this description, and military courtesy is possibly the extreme of conventional formalism and fictional depersonalization. Neither is it without significance that, as common experience in the face of battle-fire welds spontaneous bonds, the peccadillos of courtesy tend to slough off. A stern requirement for green troops (the Russians tried to do away with military formalism after the revolution, but found they had to reintroduce it), precise military courtesy, is a "pain in the neck" to the veteran on leave from the front and thrown into contact with those for whom it meets different functional imperatives. The elaborate fictions and depersonalizing conventions of legal and juridical procedure and those of parliamentary procedure are also examples of this type. But perhaps the extreme of deviousness and finesse in conventionalized fictions is reached at the diplomatic table. Here (b +) sharply clashing political, economic, and military interests have occasioned the conference; (c —) the ethnocentric patriotic and nationalistic fictions have precluded all but a slender thread of spontaneous bonds; and (a +) war or peace, victory or defeat, perhaps national survival itself depends upon the continuance, and the smooth continuance, of negotiations. Accordingly, diplomacy erects the most intricately conventionalized and fictionalized procedures. Diplomacy consists in part in saying what you don't mean; in managing to convey what you do mean; in acting as if the manifest content of what you hear were all that had been said; in detecting correctly the latent and real content between the lines; in letting the other know that you get what he has really meant; and, all the while, in neither side breaking face. Polite society is sometimes like that, too.

This is not hypocrisy, as the politically or socially untutored think. It is functional deviousness, hit upon in response to very complex situational imperatives. Any woman will tell you that, in our culture, the woman's conventional behavior in courtship must be of this devious sort—pretending innocent surprise, stimulating by resistance, and resorting to inviting retreat. All the charm of coquetry and much of the freshness and exquisite travail of young love flow from the devi-

ousness which our romantic and moral fiction put upon the love impulses. Woe to the swain who cannot thread his way correctly between the "no" on her lips and the "yes" in her eyes. And woe to the over-moral lover who mistakes preliminary nuances for cruel betrayals or deathless pledges. For these are not hypocrisies either. They are functional deviousnesses threading among very complex imperatives indeed.

Cultures differ in the extent and character of their conventionalizations. The literal honesty of the Quakers, for example, or the blunt but not ill-disposed frankness of the Pennsylvania Dutch might be contrasted with the elaborate conservation of personal dignity among the Southern aristocracy to illustrate this. Perhaps the peak of conventionalization is reached in Oriental face-saving, which is almost a basic principle of the societal organization itself. In our culture, few formal conventions characterize our primary groups. But among primitives, because of the venomous intensity which personal relations can reach in an *exclusively* primary-group universe, because of the importance of personal status in tribal relations, and because of various elements in their belief systems, personal interaction is sometimes extremely conventionalized and ritualized. In our culture, formal conventionalizations slough off in the family, but in the older European family, even intra-familial interaction was highly conventionalized. In the old Chinese family, it was extremely conventionalized. This brings us to our final example of the permutations of factors influencing conventionalization, i.e., when all three factors are high.

We are considering the case where (a +) it is extremely important that the functioning unit be not disrupted but must continue to function smoothly; (b +) there are grave strains and conflicts of interests; and (c +) there are *also* strong common interests and strong spontaneous bonds of affection. Such importance in both common and conflicting interests implies a high insistence-resistance level and is the stuff of which mores and institutions are accommodatively fashioned. The presence of strong and spontaneous affectional bonds in addition, implies one of those organically rooted, primary-folk institutions which perform a permeative, pervasive, and vital sustenance function, materially and psychically. This it does for its constituent members at its own level of integration, and as an entering unit into the larger societal integration. The family is preeminently of this type. So, in less degree, are religion and the primitive tribe-as-a-whole (scared society).

The other institutions and secular societies are somewhat less so, since the (c) factor, affectional bonds, is somewhat altered in them. Taking the family as an example, we have seen that because of its personal and whole-personed character, formal conventions tend to slough off. But informal, implicit, and "latent" fictions of the conventional type increase in number and in the gravity of their import. This is probably true even where recourse is had to considerable formal conventionalization, as in the examples cited. Because of its own contained imperatives—in order that it may continue as an interacting unit, function smoothly and without disruption, and perform the functions delegated to it by the larger society—the family must act (1) as if the fictions involved in its more vital socially delegated educative functions were actually real rather than only functionally accommodative; (2) as if sexually-toned love, with its disruptive jealousies, discriminations, etc., did not exist in intra-familial relations; but (3) as if filial, parental, and brotherly love (de-sexed or sublimated "Christian love") existed, and was the only strong emotion which did exist and have *essential* validity; (4) as if serious intra-familial aggression did not exist or have natural-order validity; but (5) as if common loyalties and common identifications did. The family must so thoroughly act as if these things were true, as a developmental milieu for the growing generation, that it makes them *become* true (functionally, in the clinched attitudes, behaviors, personalities, and characters of the interacting members).

In order to do so thorough a job at such an obstreperous level, it cannot afford to admit that the involved fictions are fictions—they must be taken as actually real! Deviate impulses must be denied their natural order legitimacy. Insight into the involved functional deviousnesses must be prevented. Discrepancies with objective reality must be repressed from conscious awareness.

The fictions of the *mores and institutions* level thus reflect the greater divergence of our lines of reference, and carry on accordingly. There is (1) a greater elaboration of formal conventions, the conventional "aspect" of mores and institutions already noted (e.g., military, juridical, parliamentary, diplomatic, and sometimes even familial courtesy). There are (2) the fictions and conventions which surround the institutionalized role—the priest, teacher, judge, prince, military officer, parent, etc., from the lowliest functionary to the Grand Lama of Tibet. Here are the endless things which, at certain ages, children do,

but keep from their parents; that parents do, but not before the children; that parents both do and require their children to do because the community, rather than their own spontaneous responses, require them, etc. Here is a greater profession of interest in things moral and spiritual than they really feel, with which the flock of the minister constantly holds up the mirror of their expectation of *him*. They act, when in his presence, as if only one of the many segments of themselves and of life had validity; and they require the person in the institutionalized role to act as though he were the personification of the control culture's values. By the time the group's pressures, the role's contained pressures, and the reificatory tendencies which flow from such consistencies in conditioning, expression, and workability are through, the highly institutionalized personage is a hand-carved instrument, a veritable "organ" of the group, for carrying out his delegated functions. He becomes quite capable of flunking his students out of school and ruining their career chances if they persist in splitting their infinitives; of bidding his daughter never to darken his door again if she will not show obedient respect to her elders and quit loving that man; of consigning his parishioners to eternal fire unless they are baptized by immersion; of consigning the rebellious to political prison or the firing squad; or of directing the torturing on the rack and the boiling in oil of those who refuse to believe. There are (3) the fictions and conventions which surround delegated roles and functions other than the strictly institutionalized roles—e.g., the culturally defined nature, role, and status of women—or of the Negro! There are (4) the fictions involved in the rationalizations and ideologies of the group, wherever these make use of fallacious material and modes of argument. This they must often do, from one culture to another, in order to induce wives to obey their husbands; slaves to obey their masters; widows to throw themselves on the funeral pyre of their husbands; maidens to go from thirteen (pubescence) to thirty-three (when they may have finally married) without sexual functioning; youths to give an arm or a leg, or life itself, in war, etc. There are (5) the implicit fictions in the ritual, ceremonial, pageantry, music, poetry, song, and story whereby emotional persuasion to the group's values (rather than the intellectual persuasion of the interbuttressing rationalization systems) is achieved.

Of these fictions at the mores and institutions level, many are true conventions, or conventional "aspects," as we have noted. But (6) the most important fictions at these levels are informal and implicit.

They are reified by the moral self; the conflicting aspects of reality are denied natural order validity; and contrary aspects and disruptive urges are repressed from conscious awareness. This is not merely because of habit, workability in the functioning framework, and the like. The group requires it. At the usages and conventions level proper, the group only requires conformity in behavior. It is quite willing for the individual to see through the involved fictions, as is also true in the appreciative-expressive and inductive cultures. Guests are no sooner out of ear-shot of the host than they are telling each other, within prudentially conventional limits only, what kind of an evening they really spent. But at the mores level, the moral "ought" is attached for the first time on our scale. Adherence is thought to be so important, and the disruptive individual impulses are so strong and so eager for rationalizations to warrant deviant behavior, that insight into the fictions and awareness of the discrepancies with what really goes on cannot be risked. Or so it is thought. The group now requires *belief* as well as conformity.

In fact, in some aspects, the group requires belief more strongly than it does conformity itself! One may violate, but if he conceals his violation (what a train of fictional disparity between ideals and practices flows from that fact!), if he is duly punished, if he confesses his shame and goes through prescribed restitutions and purifications, or if he but still feels guilt, the *framework* continues to stand. Not so, if one deny the framework itself. Professor X, and Dean Y, and even President Z (all actual cases) have had mistresses for years—but discreetly; and they always protest, indeed compensatorily over-protest, the ideals of our monogamous family. But if Professor R has an ideal home life, but calls the *framework* into question, he may not teach our American youth—not even mathematics! A Sam Insull or a Richard Whitney can do their penance and return to society, even secretly envied by many. But let the communists and atheists watch out! Every society has its modes of forgiveness and reinstatement for violations (its fines, penances, restitutions, prayers, ablutions, purifications, and even its accommodative counter-mores), so long as belief in the framework is professed. But rejection of the fictional framework is the unpardonable sin in all societies. It was not for stealing or unchastity that the Inquisition tortured and killed its victims. It was for disbelief. It is not thieves, grafters, profiteers, or prostitutes that are shot or put in concentration camps in contemporary Europe. It is those who challenge the

framework itself. "He who doth not believe, let him be anathema." The situational imperatives to this, and the creative and even spiritual potentialities of the group fictional consensus, of which we have earlier spoken, are hard to keep in mind when ranged against the stultifying, adaptation-blocking, and tyrannous aspects of such examples.

One way in which the group achieves this reification[7] of its fictions (and repression of the contravalent awareness and urges) is through a so-called "conspiracy of silence" (not that it is a self-conscious conspiracy necessarily). It is interesting that complete silence, acting "as if" the item in question had no existence at all, indicates greater disapproval and stronger taboo than when its existence is admitted, apologized for, rationalized away, attacked, and so forth. This can be seen even at the conventions level. It is in these terms that the society's and the family's silence on sex, especially in its incestuous and perversion aspects, results in such a horrendous anxiety and deep personality conflict. Children, at certain ages, refuse to believe that their parents have intercourse. Other parents might, but not theirs; or, grudgingly, perhaps the once that was necessary for the child's birth. Even late adolescents or mature people are unable to visualize intercourse between their parents. Confronted with the extreme taboo and horrendous mystery which the "as if of silence" imposes, the individual is stunned by his first awareness of sexual, incestuous, or perverse impulses. He thinks he must be some exceptional sort of monster, and he sharply represses the impulses and awarenesses from consciousness. Due to the extent to which deviations of all kinds are always concealed, and ideals professed and even compensatorily over-protested, this is implicitly true of all mores and institutions, and especially so in the religious and familial areas. Mothers, since time began, have had the evidences of infantile sexuality before their very eyes. It is easier, however, to recognize fiction (as "primitive mentality," say) when certain primitive tribes persist in believing that dead bodies do not cast shadows, in the face of the factual evidence. But even sophisticated secular societies can carry such "blind spots"—areas of extremely effective fictional silence and concealment. It was a great shock to the Western world when people like Machiavelli, Darwin, Marx, Freud, or the "muckrakers" at the turn of the century disturbed some of the vital fictions we were living by, to show us some also present realities.

There is considerable inconsistency and strain between the fictions

[7] On reification, see James W. Woodard, *Intellectual Realism and Culture Change*, Sociological Press, Hanover, N. H., 1935.

in the various parts of the same culture, especially in complex, secular societies. The three parts of the culture have their differing fictions and "contained" ideals. Educational, religious, military, juridical, governmental, and welfare institutions are under considerable strain with each other in Western society at present. Each delegated role, profession, occupation, interest group, or other social fracturation due to the division of labor, *tends* to do likewise. This is inevitable in view of the "center of reference for meaning and value" which is implicit in all functioning and group formation. Each cultural stratum, class, socio-economic level, and ecological region tends to diverge similarly in its "way of life" and the involved supporting fictions. So does each culture, national grouping, formal political state, and the like, taken as a whole. Within each culture (even simple and sacred societies), there is always a strain between (1) the organizational mores (and their supporting conventions and usages), (2) the humanitarian mores, and (3) the "counter-mores" which support the actual practices in their disparity with the ideal professions of the group.

Thus, the pattern of strain between conflicting ways of life and their supporting fictions, often idealized, reified, and sanctified, becomes extremely complex, now that transportation and communication are welding the entire globe into the interdependence of the Great Society. By the same tokens, the strain toward an integral framework of meaning, giving sense to the various parts, and setting divergences into understandable perspectives, is the great intellectual strain of our time. The old tribal frameworks are rapidly disintegrating, and a new, self-validating, and universal framework has not yet appeared. Neo-Thomism, the educational proposals of Mortimer Adler, recourse to force and propaganda, and the philosophies of dictatorial totalitarianism are attempts to achieve that framework by force, or by regression to frameworks which once sufficed. But the historical imperatives of the past and those of the future seem apt to be in so many ways almost diametrically opposite,[8] that such attempts can have at best a short-lived success. They must fail as the Inquisition failed, only much more quickly, since science, transportation, communication, and the other individuating forces were only in embryo at the earlier period. The sole long-run hope is in a genuine merging of the global collective interests and the erection of an integral frame of cultural meaning-reference. Both of these depend in turn, in no inconsiderable

[8] See James W. Woodard, "Cultural Evolution and the Social Order," presidential address before the Eastern Sociological Society, in *Jour. Soc. Phil.*, **6** (7): 313-326.

measure, on the extent to which the human and social sciences embrace their functional character and begin to give us adjustive *wisdom* as well as sheerly factual description. That is our strategic reliance for the future.

The economic interdependences of modern times are a transitionally disruptive, but long-run integrative factor. The inductive culture is in its very nature potentially universal in character. The utility usages of the control culture have a similar universal potentiality. The appreciative-expressive culture and the folkways proper may, in terms of their low insistence-resistance level, permissibly vary with enrichment and enjoyable variety accruing. The humanitarian mores, in the control culture, occur in all cultures and have a contained strain toward intercultural or universal validity. But the rest of the control culture, from conventions on up, varies viciously, becoming reified, sanctified, and defensively or evangelistically bellicose. This follows from taking the involved fictions as actually real. Societies will have to continue doing this until the functional sciences can yield some sure-footedness to adjustive relativities. The human-social sciences cannot do this, in turn, if they keep straining for inorganic-science objectivity; or if they are merely pietistic, moral, nationalistic, or adopt some single center of functional reference, as, for example, does German geopolitics.

There are certain key fictions which more or less characterize all control cultures in *past* history. Their creative and integrative utility must be fully realized; and at the same time their tribal character, their blocking of inter-cultural adjustment, and their stultifying influence and sometimes inhuman consequences must be frankly faced. These key fictions are: (1) That there are gods, although the convergence of inference from biology, psychology, psychiatry, sociology, anthropology, and philosophy is that there really are no gods. The gods are tremendously vital societal projections; important functional fictions, but still fictions. Several corollaries follow: There are gods, and (a) our tribe's god is the true god; (b) we know the god's will; and (c) he sanctions our tribe's ways and strengthens our cause when we fight other tribes with other ways and other gods (or even with the same god!—for the gods are always peculiarly *ours*).

(2) That right and wrong are absolutes and eternal verities, although the convergence of inference (again from biology, philosophy, but especially from psychology, psychiatry, sociology, and anthropol-

ogy) is that morals and the concepts of right and wrong are group situational emergents. Morals reflect, on the one hand, the universal values situationally imperative from the nature of group living as such (such as the humanitarian mores and the mores of reliable predictability); on the other hand, they always reflect the endless tribal relativities of morality which flow from the differing environmental and historical imperatives and the differing centers of reference for meaning and value of the groups which throw them up. Similar corollaries follow this fiction: Right and wrong are eternal verities, and (a) our tribe's ways are right; (b) where the ways of other tribes clash with ours, they are wrong, and (c) eternal righteousness is on our side.

(3) That the individual is a free-will agent and could follow this right if he would, although the convergence of inference from the same cluster of sciences is that man is a part of the cause-and-effect universe. This is true however much his determination is an "organismic" one (permitting the use of reason as, in turn, affected by hereditary needs, past experience, emotional fixations, repressed conflicts and distorted symbolisms, cultural frameworks, social imperatives, etc.) rather than a detailed specific inorganic-mechanical determinism. Corollaries flow from this fiction in turn: People are free-will agents and could do right if they only would, and therefore, (a) punishment (*as* punishment, not as the involved disciplines of training, rehabilitation, or therapy) is deserved by the individual; and all the sadism that is poured into punishment from petty stigma to the mass tortures of wars and inquisitions are therefore justified; and (b) the feelings of shame and guilt are also justified, with all their travail and lonely ache and sometimes suicidal mosochism.

(4) Most cultures also hold, somewhat as corollaries of (1) and (2) above, that the tribal morals and institutions are pure values, ends in themselves, rather than seeing them as accommodative devices to be altered, scrapped, or replaced when they no longer function properly or when changing imperatives call for different accommodative devices.

(5) The fictions involved in the concept of loyalty, especially loyalty to the in-group, are also universal among control cultures.

The pattern of stigmatization and praise varies up our scale and reflects the greater and greater insistence-resistance tension of the more and more diverging lines of meaning-reference. The deviator from the folkways ("violator" is here too strong a term) is regarded with whimsical indulgence. The violation of the usages is regarded

as ridiculous; that of the conventions as uncouth and in bad taste; that of the mores as wicked, bad, and sinful; and that of the institutions as criminal, unnatural, abnormal, and monstrous. These stigmatizations are reified by the tribal member with corresponding feelings ranging from chagrin to suicidal guilt. These stigmatizations are cumulative, the violation of the mores being in bad taste as well as wicked, that of the institutions wicked as well as criminal and unnatural. Objective punishments parallel this series, ranging from a tolerant smile or hand-slap to banishment or electrocution. Correspondingly, rewards to the conforming member's self-feelings are bestowed, ranging from the certification of his propriety to deeply resonant moral and spiritual values. These are psychic rewards and punishments which, together with the objective rewards and punishments, help to bridge the gap between the more and more diverging lines and to make the group way of life the actually real world of meaning for the individual (as it thereby *becomes* even in, say, cannibalistic societies as a framework of limitations, workabilities, and practical realizational possibilities).

The increasing stigmatization and laudation, and the increasing punishment and reward reflect, of course, the increasing pristine resistance as well as the group insistence. So does the fact that the usage stigma—ridiculous—fails to carry up. The violator of the mores or institutions may be wicked, etc., but there is too much vicarious identification with him and secret admiration of his courage, if not of his morals, for him to be ridiculous to any but the most naive of the tribal members. The mounting resistance is also reflected in the epithets which the self-conscious rebel, in any given culture, hurls at the patterns themselves. He stigmatizes them for what they are if we overlook the functional character of their fictions, and for what they become even functionally, when they cease to have historical appropriateness. Thus, the self-conscious rebel stigmatizes the usages as meaningless; the conventions as hypocritical; the mores as inhuman (e.g., the Hester Prynne situation in the *Scarlet Letter*); and the institutions as unjust. These epithets are also cumulative, again with the exception of that of the usages—meaningless.[9]

It is apparent that, while the rebel can stigmatize fork-preference

[9] In terms of precise definition, the *folkways*, are culturally carried patterns of behavior that involve so little tensions and disparities that they are all but unselfconsciously followed, true group habits. The *usages* are cultural patterns which involve an arbitrary "as if." The *conventions* involve, in addition, directly false fictions. The *mores* (still cumulatively) further invoke the moral "ought," rationalizing ideologies, emotionalizing rituals and ceremonies, and super-rational sanctions. The *institutions* add to all these the additional factors of an organization and personnel to enforce and propagate the behaviors and involved values and beliefs.

for pea-eating at the usages level as meaningless, he will have much less success in stigmatizing as meaningless the fictions of standard time, weights and measures, vocabulary, and the like. Here, their functional utility precludes any meaninglessness. Several considerations follow. What the person is really doing in using the fork for his peas is indicating his social status—that he "belongs" to that tribe or class level which carries the given definition of propriety. His chagrin in lapsing into the use of the knife or his fingers is not in the functional inappropriateness of those instruments but in the betrayal that he really doesn't belong. Thus, examples of the various patterns up our scale will fall into two groups: those that have been thrown up predominantly by the forces at the given level and which are susceptible of functional justification at the given level itself, and those which predominantly derive from, or help buttress, patterns higher in the scale and whose functional justification will to that degree be contingent upon justification of the pattern from which they derive. Thus the usages of utility (communicability, predictability, etc., as in vocabulary, gesture, units of measure and the like); the conventions of human consideration and of a finer art of social interaction; the humanitarian mores and the mores of reliability (honesty); and the welfare institutions (whether protective, disciplinary, ameliorative, or creative-realizational in their welfare emphasis); these have been thrown up by the contained strains of their own insistence-resistance levels, and can be justified or subjected to refinement and correction at their own levels in turn. But the usages of status or of feminine propriety; the conventions of modesty or courtship, or those surrounding the specific institutionalized roles; the mores of chastity or those involved in the particular property forms; and exploitative institutions such as slavery, caste, and some religious, governmental, and property forms; these cannot be justified at their own level alone. They are derivative patterns, and their functional justification depends also upon the functional validity of the patterns they derive from and which they help buttress.

With reference to the exploitative institutions just mentioned, it is most important to point out that this whole series of derivative and cumulatively buttressing patterns and fictions is subservient to the power, prestige, and wealth factors in the class structure and the *social* organization in turn. This deserves volumes of comment and intricate analysis. But we are here confining ourselves to the cultural factors *as* cultural.

The group defines "truth" and "morality" pragmatically, in terms of workability from its own (or, historically, often from the ruling class's center of reference. But it will not stand for it if the individual uses truth or falsity with equal readiness, depending upon which works better from *his* center of reference. That is lying, and is wrong. When the inspirational leaders of the tribe speak of devotion to Truth, with a capital T, they do not mean the truth of science. Nor do they mean any disturbing analysis of the other facets and centers of reference for meaning and value. They mean not truth but the tribal fictions. But the group itself is quite opportunistically pragmatic in this regard. The same group that forbids you to lie about important matters which seriously disturb predictabilities at the mores level, commands you to lie (white lies that keep the surface smooth) at the conventions level, and requires you both to lie and to kill, when an enemy-group is concerned. Morals are a group-situational emergent. As such they invariably carry the implicit in-group center of reference of the group which throws them up, or of the prestige group which can most influence them, and in such pragmatically functional terms. For while the discrepancies just noted are objective inconsistencies, they are functional consistencies. Moral pronouncements tend, however, to be reified and absolutized and to be passed on in such terms. Thereby, in the naivete of the over-conscientious and the conscientious objector, morals set up a strain toward greater internal consistency. In connection with the humanitarian mores, morals thus presently tend to undermine their own ethnocentric and sometimes exploitation-facilitating character, and to undergo change from repressive tribal morals to a positive and universal ethic.

The deep repressions, thwarts, and reified fictions of the mores and institutions level enter most significantly into personality conflict. But the conventions are not wholly without significance in that regard. If they do not involve actual repression, they do sometimes involve inhibition and considerable thwart and frustration, especially frustration of sexual and aggressive impulses. The thoroughly conventional person, like the thoroughly moral one, is apt to lead a narrow and barren existence within a frame of reference that doesn't exactly accord with reality. Yet in a sense it is reality; and if everybody lived out its fictions consistently, the creative aspect of the conventional fictions is capable of achieving a more civilized level of existence in which conflicts are processed smoothly, feelings spared, and new

values created—a finer art of life. It must be seen that, up to a point, conventions, and mores and institutions with them, can be thus creative of new values. Beyond a point, they become hypocritical, tyrannous, exploitative and inhuman. If the underlying tensions are grave enough, it becomes ostrichism to keep surfaces smooth by acting as if the tensions were non-existent. To do so is futile, as both psychoanalysis and the history of revolutions show. The societal fictions are potentially both creative instruments and inhuman tyrannies. During the developmental period of a given cultural order, most is probably gained by living out its fictions, living up to its ideals. But in the long course of history, it proves to be as important that men lose their specific ideals as that they live up to them. A vigilante member and a revolutionary party member represent the two extremes. The first has reified the fictions of the status quo, *as is*, making no distinctions among them. All that is needed is to make people, by force, if necessary, live up to them. The second is apt to reject the fictions and ideals of the given status quo *in toto* as "bourgeois sentimentality," or the like, only to find, after he has made his revolution, that he has to bring some of them back, or that he is confronted by a new set, derivative from the new social order. For better institutions can diminish the strain between our three lines, but can never completely coalesce the lines. Therefore, any set of institutions entails its derivative mores, conventions, and usages. If, under monogamy, I must act as if I did not love another's spouse (although I do), under free love, I must act as if I were not jealous or wounded, when someone else makes love to my love object (although I am). And so on.

Traditional morals and religion on the one hand, and science and psychoanalysis on the other tend to take opposite points of view on these matters. Morals and religion tend to reify the absolute character of the ideals and fictions, let the guilt feelings and other maladjustments fall where they may. Functional science and psychoanalysis tend to recognize the natural-order legitimacy of both sides of the ambivalence, to recognize the instrumental and accommodative character of ideals and fictions, to analyze their functional appropriateness and modify them a bit in the direction of reality-contactedness. They thus hope to free man of his age-old burden of guilt, and to engineer the creative and realizational potentialities that lie in our diverging lines, their integral coalescence, or their smooth accommodation, involved fictions and all.

We cannot here go into all the relativities, subjectivities, hazards, disciplining safeguards, and complexities of interfunctional frameworks that are involved in attempting inductive appraisals of functional appropriateness. We realize the difficulties as well as the vital importance of such attempts. Relative to cultural fictions, the generalized criteria are three-fold; (1) provable utility; (2) aesthetic value; and (3) humane consideration. These criteria reflect the contained ideals of the three parts of the culture and the contained strain to assimilate or transform the arbitrary and extrinsic aspects of the control culture so as to yield a more integral framework of meaning-reference. Utility (1) enters at the usages level in the communicabilities and predictabilities established by many of the usage fictions. These utilities are researchable and subject to inductive cultural absorption, involved fictions and all. The same is true of the utility, predictability, and security aspects of conventions, mores, and institutions; but this is more difficultly true, so to speak, and is contingent upon the achievement and successful development of the functional human and social sciences within the inductive culture. The aesthetic criterion (2) enters also at the usages level in the aesthetic usages, and continues on through conventions and the other patterns in those aspects concerned with a finer texture of social interaction and a more highly developed art of living, involved fictions and all. It contains some unifying elements and some elements of enriching diversity. The humanitarian criteria (3) enter first at the conventions level in the conventions of face-saving and human consideration, and continue on in the humanitarian mores and the welfare institutions. The graver predictabilities involved in the mores of reliability and the laws; the security of status (government), security of sustenance and possessions (property), security of love (family), etc.; and the safeguarding of the psychic incomes and material benefits inherent in the group's "way of life"; all these involve our same three criteria at their graver and more complex levels. Social status and social organization are thus seen as legitimately deriving from social function and from the cultural organization, rather than, as in the historic past, the other way round. For there are no other "contained" functional criteria in social-cultural structuration and processing *per se*.

This is important to see, because, in actual historical settings, there have been other criteria of great forcefulness and of a natural-order inevitability relative to the historic situation. We refer to such

things as the existence of the gods, the divine right of kings, white supremacy, the sanctity of private property, the natural right of individual enterprise, etc., whereby the control culture has been made to buttress the social organization, the class structure, or exploitative institutional forms. It is not without significance that, when insight into the fictions of standard time is gained, one has no tendency to destroy his watch or to cease acting out the fictions anyway. But when one gains insight into the fictions of monarchy or of white supremacy, he ceases to obey, and begins to plan how to change the social order from which the fictions derive. It is in these terms that one might expect, under the impact of individuation, mobility, social fracturation, the development of scientific scepticism, increasing material interdependence, etc., a long-run trend undermining those merely tribal or arbitrarily historical criteria which run out to the class structure or to the supposed gods for the sanctioning of inappropriate and exploitative mores and institutions. The *long* future probably thus belongs to the positively *creative* state, rather than to the exploitative, repressive, or merely refereeing *laissez-faire* state—to the society with welfare-based social institutions whose techniques and supporting cultural patterns and belief systems, involved fictions and all, have a functionally oriented inductive culture as their sure-footed foundation.

That such a society would have ethical and spiritual values of compelling meaning-resonance must be quite apparent. Beginning at the usages, and diverging more and more up our scale is a discrepancy between objective or material reality and another "order of reality," that is at first seen as only fictional in the usages and conventions, but later correctly seen as perhaps a more *vital* order of reality than material reality itself. Yet its unreality is sensed, too. At the conventions level, one acts as if the fictions were real up to the point of wringing from them their face-conserving considerations and adjustive utilities. But it is a tragic error to take them as actually real—to transform their face-saving into paranoid self-confidence, their coquettish deviousnesses into deathless pledges, or to inflict yourself upon the prime minister because he said he hoped to meet you again soon. At the mores and institutional levels, the counter-mores develop. These parallel (with a great divergence) the moral and spiritual values of the group. There develop the accommodative devices of forgiveness and reinstatement already mentioned. The group will crucify the one who insists upon acting as if the ideals were actually real about as readily

as it will burn at the stake the one who denies their greater reality over materially-defined truth. The illusion must be kept and lived by. But it must not be disclosed that it is not actually real; or yet lived out as if it were. Mankind, thus far in history, has needed his practices and his ideals; his realities and his dreams. He has needed them both. He has needed to believe that they are the same thing; that they are different orders of reality; that now this one, and now that one is the more imperative, the seat of the greater wisdom, the depository of the higher and richer values. It is because the whole area is so full of paradoxes, so recondite and yet so compelling, so full of inmost yearning and so tyrannous in its "exteriority and constraint," that this area is so fertile in personality conflict, exploitations, social tyrannies, and bizarre and superstitious imaginings. It is our conception that the functional human-social sciences, slowly and arduously enough at first but with some of the inductive culture's characteristically cumulative and accelerative mastery, might one day ease these tensions, converge diverging lines, bridge widening gaps with smooth accommodative devices, and validate legitimate, *natural-order* "ethical" and "spiritual" meanings—involved fictions and all. Then the social order and the cultural framework might begin to yield on a global or inter-tribal scale, that inclusive, consistent, and richly meaningful configuration of the total universe and the individual's relation to it that shall resolve the age-long internal and external conflicts and produce those creative and realizational harmonies and communions which have been the common aim of humanitarian striving, art, religion, ethics, philosophy, psychiatry, and the functional sciences.

NEW MEMBERS

ELECTED MAY 16, 1944

ACTIVE MEMBERS

D'Alelio, Gaetano F., Ph.D., High Polymers, Director of Research, Pro-phy-lac-tic Brush Company, Florence, Massachusetts.

Keeffe, George C., Ch.E., M.S., Chemical Engineering, Associate Professor in Chemical Engineering, Newark College of Engineering, Newark, New Jersey.

Leathem, James Hain, Ph.D., Endocrinology, Assistant Professor of Zoology, Rutgers University, New Brunswick, New Jersey.

Loewi, Otto, M.D., Biology, Psychology, Biochemistry, Research Professor, New York University College of Medicine, New York, N. Y.

Lowenstein, Bertrand E., M.D., Endocrinology and Metabolism, Research Fellow in Medicine, New York Post-Graduate School and Hospital, New York, N. Y.

Oglesby, Nicholas E., Ph.D., Chemistry, Technical Director, Behr-Manning Corporation, Troy, New York.

Sklar, Alfred Lee, Ph.D., Molecular Structure, Assistant Professor of Chemistry, Catholic University, Washington, D. C.

Somberg, Ethel W., B.A., Biochemistry, Assistant Research Chemist, V.D. Research Laboratory, U. S. Marine Hospital, Stapleton, Staten Island, New York.

Wintersteiner, Oskar Paul, Ph.D., Organic Chemistry, Biochemistry, Head, Division of Organic Chemistry, Squibb Institute for Medical Research, New Brunswick, New Jersey.

Wolf, William, M.D., M.S., Ph.D., Endocrinology, Consulting Endocrinologist, New York University School of Dentistry and Misericordia Hospital, New York, N. Y.

ASSOCIATE MEMBERS

Bernstein, Jack, Ph.D., Organic Chemistry, Research Associate, Division of Medicinal Chemistry, The Squibb Institute for Medical Research, New Brunswick, New Jersey.

Frazier, Chester North, M.D., Dermatology and Syphilology, Professor of Dermatology and Syphilology, University of Texas School of Medicine, Galveston, Texas.

Fry, Edith G., M.S., Biochemistry, Research Assistant, Yale School of Medicine, New Haven, Connecticut.

Grainger, Thomas R., Jr., Ph.D., Bacteriology and Public Health, Bacteriologist, U. S. Army.

Hofmann, Klaus H., Ph.D., Biochemistry, Assistant Research Professor and Senior Research Fellow, Department of Chemistry, University of Pittsburgh, Pittsburgh, Pennsylvania.

Shaw, Thomas Martin, B.S., M.A., Physics, Physicist, U. S. Department of Agriculture, Albany, California.

Skarstrom, Charles, Ph.D., Physics, Physicist, Standard Oil Development Company, Elizabeth, New Jersey.

Swan, Donald R., Ph.D., Chemistry, Research Director, The Forbes Varnish Company, Berea, Ohio.

Fundamental Concepts in the Treatment of Diabetes Mellitus and Its Complications

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NEUROLOGICAL DISTURBANCES IN DIABETES MELLITUS*

Neurological manifestations are very common in patients with diabetes mellitus. They may be transient and last for a few hours or a few days, or they may be of the more severe and progressing type. Transient hemiparesthesia or hemiplegia, also double vision and various mental symptoms may be brought about by hypoglycemia in patients who are taking insulin. A cerebral vascular spasm even without insulin may cause a transient hemiplegia. A cerebral vascular hemorrhage or thrombosis will result in a more prolonged neurologic picture. Naturally any diabetic patient is subject to all of the neurologic conditions which may affect any non-diabetic subject.

The most common neurologic disturbance in diabetes is neuritis. It is so frequent that it is known as diabetic neuritis. Since the process is not of an inflammatory nature, it would seem better to speak of it as diabetic neuropathy. There is still a common belief that the neuropathy is only of a peripheral character. Contact with many diabetic patients and careful search for neurological signs reveals the more generalized character and frequency of this disturbance. It may involve any part of the nervous system (central, peripheral, or autonomic). The diagnosis of diabetic neuropathy not infrequently presents a problem.

The symptoms and signs vary a great deal. Glove and stocking paresthesia as well as paresthesias in other parts of the body are most common. Pain is frequent. It may be generalized or localized. Paresis or paralysis and atrophy of various muscles as well as ataxia of the lower and even of the upper extremities are not infrequent. Diminution and absence of the knee jerks has been observed frequently enough in diabetic patients to call it tabes diabetica in contrast to tabes dorsalis (syphilitica). Loss of weight, general weakness and numerous psychoneurotic complaints are the usual attendant symptoms of diabetic neuropathy. At times there are genito-urinary complaints such as urinary incontinence or retention with or without overflow.

In the early stage of the neuropathy most of the neurologic complaints are very vague and only of a subjective character. The objective neurological signs are minimal, if any. In these cases malignancy and various other diagnoses are not infrequently made because of the generalized symptomatology or because of severe pain which at first does not have a characteristic nerve distribution. On the other hand, in the advanced stage the neurologic condition may be confused enough to simulate various neurologic diseases,

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* Submitted by Abraham Rudy, M.D., Boston.
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such as tabes dorsalis, central nervous system syphilis, combined system disease as of pernicious anemia, and tumors of the brain or cord. The frequent presence of signs of involvement of the peripheral nerves in addition to the other neurologic symptoms is characteristic for diabetic neuropathy. The total protein of the spinal fluid is frequently increased with an absence of cells.

The symptoms and signs of diabetic neuropathy may develop: with the onset of the diabetes whether this be acute or gradual; immediately following the control of the diabetes; and during the chronic stage of the diabetes whether controlled or uncontrolled. It is not directly related to the glycosuria or hyperglycemia. It is frequently present in latent stages of diabetes and may thus easily be overlooked.

The cause of diabetic neuropathy is still unknown. Arteriosclerosis involving the small vasa nervorum and thus producing an ischemic neuritis is considered by some to be the causative factor. This may be true in an occasional case. This theory does not hold, however, in the patients who have no demonstrable arteriosclerosis and in those who undergo complete recovery. How much the diabetes in itself is responsible for the development of the neuropathy is still difficult to say. Prolonged uncontrolled diabetes acute or chronic, with its accompanying marked loss of weight not infrequently precedes the development of acute diabetic neuropathy, while rapid control of the diabetes also will bring it acutely afore. This suggests that the diabetes in some way directly or indirectly may affect the nervous tissue.

There is accumulating evidence that most of the symptoms observed in patients with diabetic neuropathy have been seen in humans suffering from induced prolonged partial thiamine deficiency, and that the neurological signs are a late manifestation of a deficiency in this factor. Pathological examination of the nervous tissue in patients with diabetic neuropathy shows demyelinization of the nerves which is consistent with a neuropathy of a nutritional deficiency. It is also worth noting that patients with diabetic neuropathy not infrequently show signs of a deficiency in the other factors of the vitamin B-complex producing cheilosis, beefy tongue, various pellagrous skin lesions, and mental changes. The probability that diabetic neuropathy is a late manifestation of thiamine chloride deficiency is thus strongly suggested. The deficiency is rarely of the primary type, or that type due to poor intake of the vitamin but is more likely secondary in nature, namely "conditioned" by the disturbance in the carbohydrate metabolism. Impaired liver function and poor absorption may also play a part.

The treatment of the neurological disturbances in diabetes mellitus depends on establishing a correct diagnosis. If the disturbance is due to hypoglycemia, the cause of this state whether it be an overdose of insulin, over-exercise, or omission of a meal, should be determined and properly corrected. In cases of cerebral vascular accident the usual treatment should be carried out. In addition, insulin should be so regulated as to prevent hypoglycemia. As to the treatment of the diabetic neuropathy, control of the diabetes on a well balanced diet is essential. On the other hand, the administration of vitamin B-complex and of thiamine chloride should not be overlooked. The more severe the neuropathy, the more important it is to administer the thiamine parenterally, in adequate dosage (30-50 mg. per day), and for a sufficiently long enough period, namely, for months and at times even for years, since the change in the nervous tissue in the severe case is anatomical and if reversible at all, only very slowly. Noticeable improvement may not start until several months of treatment have passed. Perseverance in treat-

ment and over-treatment are essential to insure improvement or recovery. The response is similar to that in combined system disease of pernicious anemia on liver therapy.

It is worth remembering that in diabetic neuropathy the subjective neurological signs are first to appear and first to recede, while the objective signs are usually slow in developing and also very slow in clearing. Physiotherapy with active and passive exercise for the weak muscles, and the use of various mechanical apparatus for paralyzed limbs are of great help. Special care should be given to avoid accidents which may occur as a result of the muscular weakness and unsteadiness.

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KEEP FOR REFERENCE